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THE UNIVERSITY OF ALBERTA

A STATISTICAL MODEL OF INTERNATIONAL TRADE BETWEEN CANADA AND TEN COUNTRIES

by

© ROBERT F. SPRAGINS

A THESIS
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FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "A Statistical Model of International Trade Between Canada and Ten Countries," submitted by Robert F. Spragins in partial fulfilment of the requirements for the degree of Master of Business Administration.

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Date July 18, 1975.

ABSTRACT

The objectives of the study were to provide marketers with useful insights about international trade and to develop limited scale statistical models of trade. In addition, the intent of the paper was to investigate and define which aspects of a nations economy are important in determining the occurrence of international trade.

Considering the extent to which the research was carried out, the stated objectives of the paper were fulfilled. Of a possible twenty-two models of trade, six import and six export models yield viable information for the marketer.

There are several important findings of the study which have significant ramifications for the international marketer.

Firstly, the data analysis indicates that no two countries are similar with respect to the economic and marketing variables that interact in the international trading environment. This finding is important for marketers because it emphasizes the need to formulate marketing plans and strategies according to the different variables which enable countries to engage in trade.

Secondly, the analysis of the paper suggests that government involvement and consumer preference have important roles to play in international trade.

And thirdly, on an international scale, the study demonstrated that statistical tools are viable methods for analyzing marketing problems.

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INTRODUCTION

The Problem

The problem, for which this thesis will attempt to find an answer, what are the causes and determinations of international trade; in other words, why do countries engage in international trade?

Specifically, the problem will be analyzed within a statistical framework using Canada's aggregate trading relationship with ten countries, and ten countries individual trading relationships with Canada.

The Objectives

The primary objective of the thesis is stated as follows:

> To provide useful insights for the marketer who is concerned with the trading of products or services across international boundaries.

The secondary objectives of the thesis are as follows:

> To investigate and determine which aspects of a nation's economy are important in the determination and occurrence of international trade.
>
> To formulate a limited scale statistical model of international trade.
>
> To design a model(s) of international trade which will have practical applications such as in the field of international marketing.

The Reasons

Until recently, the traditional theory of Comparative Advantage has experienced widespread acceptance although economic theorists are beginning to consider new possibilities for explaining the occurrence of international trade.[1] For example, some of the theories and hypotheses include human capital and the level of research and development expenditures within a nation's economy.

Much of the impetus for revising the direction of research in international trade theory is gained from the changing complexity of world economic conditions. In addition to the above, changing thoughts have occurred because of the consternation surrounding the United States deficit in Balance of Payments, which to many trade critics is a highly undesirable economic posture. Furthermore, the Balance of Payments problem is hindering other national economies such as the United Kingdom's. The Balance of Payments problem, in itself, has brought about developments towards changing the perceptions of Comparative Advantage and other trade theories.[2]

The above discussion presents some economic rationale that might possibly support further theoretical research into international trade. However, what of the marketers, particularly those employed in the private sector, who are confronted with the task of deciding how, why and when to exchange products or services with another country? For the marketer who is orientated more towards the practical rather than the theoretical, the problems of sifting through numerous and complex models of international trade may be extremely difficult and unrewarding in the long run.

Thus, this paper shall delve into some of the new areas and ideas of international trade in an attempt to extract economic rationale which will be useful towards the design of a model of international trade with practical marketing applications.

Topics of the Paper

Topics of discussion in the paper will include: Literature Review, Statement of Hypotheses, Assumptions, Limitations and Methodology, Design and Theory of the Model, Data Analysis and Conclusions.

FOOTNOTES TO THE INTRODUCTION

[1] Leontief (1953 and 1956) presented evidence that contradicted the traditional Theory of Comparative Advantage where he concluded that the United States exported labor intensive products rather than capital intensive products. His research results were in direct contradiction of the Heckscher-Ohlin Trade Model which used the traditional theoretical assumptions of Comparative Advantage Theory. For a more complete discussion see Wassily Leontief, "Domestic Production and Foreign Trade: The American Capital Position Re-Examined." Proceedings of the American Philosophical Society, Vol. 97, No. 4, September 1953; and "Factor Proportions and the Structure of American Trade: Further Theoretical and Empirical Evidence," Review of Economics and Statistics, Vol. XXXVIII, No. 4, 1956.

[2] See Federal Reserve Bank of Richmond, "Changing Views of Comparative Advantage." Monthly Review, July 1972, pp. 18-24.

CHAPTER I

LITERATURE REVIEW

Most theories of international trade deal with the Theory of Comparative Advantage in either an explicit or implicit manner. These different theories generally tend to be mutually exclusive; however, in some cases, they are not without similarities. The similarities and differences between different theories of comparative advantage will become evident during this chapter.

Typically, the theories attempt to show that one country has or will have a comparative advantage over another country because of some aspect of the economy such as a highly specialized research function or a more capital or labor intensive economy. In general, trade theories incorporate one of two views of comparative advantage, are either the traditional view or the current view.

The purpose of this chapter will be to review some of the traditional theories of comparative advantage and to examine some of the theories which are currently in vogue.

Heckscher-Ohlin Trade Model[1]

The Heckscher-Ohlin model of trade is better known to economists as the Theory of Factor Proportions. Generally, factor proportions theory follows the assumptions of trade originally established by Ricardo in the 18th century.

The objectives of the model are two-fold. Firstly, the model attempts to predict patterns of trade between countries engaging in international trade. Secondly, the model attempts to indicate which countries will export a particular product and in what quantity.

The model is based primarily on differences in relative factor proportions of countries that are engaged in trade. The model assumes that for each country there are identical production functions for the same product. However, the production functions may vary among individual producers. The proportion of factor endowments between countries are reflected internationally in differences of pre-trade commodity prices. "Unless demand patterns differ significantly, a country will hold a comparative advantage in those products intensive in the countries relatively abundant factors and a comparative disadvantage in those products intensive in its relatively scarce factors."[2]

The principal advantage of the H-0 model is its relative simplicity. Nevertheless, this inherent simplicity causes some serious disadvantages. The disadvantage of the model became apparent when it was unsubstantiated in a test against the aggregate trade flows of several countries. Leontief (1953 and 1956)[3] illustrated this proof when he found that . . . "contrary to most considered judgement, the United States exported labor-intensive products and imported capital-intensive products."[4]

Quite naturally, Leontief's proof prompted new research into the area of trade theory by creating a certain amount of dissatisfaction related to the predictive capabilities of the Heckscher-Ohlin Model. The lack of the H-0 model's predictive powers stem directly from its inability to contend with comparative advantage in a dynamic framework.

Domestic Demand as an Indicator of a Countries' Exporting Ability

Linter (1961)[5], following the lines of factor endowment theory, "presented the hypothesis that the volume of trade between two countries is larger the closer they are in terms of per capita income; to the export potentiality developed in the two markets by the similar national demand pattern that accompanying similar levels of income."[6]

Basevi (1970) argues that the hypothesis of Linter is basically correct and concludes in his own study that, "domestic demand is a prerequisite to the development of an export industry when the net price that can be obtained in foreign markets is below the minimum average cost, provided domestic demand can be exploited monopolistically and that the foreign price covers marginal cost before exporting."[7] In his summary, Basevi continues by stating, "[it] has been shown that a private monopolist might not trade a product that should be imported; that it might export too much of it, or even export it when in fact it should be wholly consumed domestically and perhaps supplemented by imports."[8]

Basevi formulates his arguments on several important assumptions. Because of the size of some countries' economies, they are capable of economies of scale; however, the demand for internationally standardized products allows smaller countries to exploit the situation by producing standardized products for exporting and importing those products which are not standardized.[9] In effect, the international position of a small country in terms of the size of its economy yields it a comparative advantage.

The "economies-of-scale" hypothesis was elaborated upon by Drize (1960)[27], who inquired into the export-import performance of Belgium. He advanced the hypothesis that small countries have a comparative advantage in products that are internationally standardized and subject to economies of scale.[28]

Hsu (1972), not satisfied with the extent of Basevi's hypothesis development, presented his own views on domestic demand and the ability to export.[10] Hsu suggested several important questions that should be considered:

(1) What about changes in domestic demand?

(2) Once a commodity is exported, is domestic demand still needed?

(3) How will a growing or declining domestic demand for an industry's products affect its export competitiveness?[11]

The fundamental objective of Hsu's paper is "to provide some tentative answers to these questions and thus to generalize the relationship between domestic demand and the ability to export."[12,13] In order to accomplish his objective, it was necessary to expand the time horizon to facilitate a normative analysis. Hsu reasoned that,

> In the short-run, domestic demand for a certain good is determined by its price and income elasticities of demand, the level of income, and the distribution of income. Other things being equal, the demand for a normal good will increase when the level of income increases; that is, its income elasticity of demand is positive.14

For the long-run he contends,

> as growth proceeds, a stage will be reached where the income level is high enough to cause consumers' demand to shift to better substitutes, such as from bicycles to motorcycles and then to automobiles.15

Thus, Hsu concludes that over time, the income or growth elasticity of demand for most products of a given quality will change from positive to negative because individuals can afford better substitutes.[16] Furthermore, there are three stages of growth concerning a countries ability to export, which are: (1) when domestic demand emerges; (2) when domestic demand grows; and, (3) when domestic demand declines and shifts to better substitutes.[17]

Human Skills

Waehrer (1968),[18] following the research of Kravis (1956),[19] . . . "related the existence of higher wages in United States export industries than in import-competing industries to the fact that the former industries employ a more skill-intensive labor mix than do the latter industries."[20]

Waehrer's analysis was carried out by constructing what she termed an industry skill index. This index was calculated by combining several occupational classes such as professional, technical and managerial while excluding occupational groups which were not directly associated with the manufacturing process. This portion of the labor force was then compared to the total labor force as a percentage index.

Waehrer's principal conclusion was that she found a significant relationship between an industry's trade balance (exports less imports) and its skill ratio as measured by her skill index.[21]

Technological Gap

For the most part, a technological gap in the industries of trading countries is viewed only as a temporary comparative advantage. Posner (1961) stated that, "trade in new products or products incorporating new techniques exists temporarily due to an 'imitation lag'".[22] Additional research by Hufbauer (1965) concluded that, "impermanent commerce which initially arises from the exporting nations industrial break-through, is prolonged by static and dynamic scale economies flowing from the break-through."[23]

Further empirical evidence on this theory was provided by Keesing (1967)[24] and by Gruber, Mehta and Vernon (1967).[25]

Both studies indicated that an industry's trade performance is highly correlated with its expenditures on research and development and with the number of scientists and engineers engaged in R & D work as a percentage of the total industrial labor force.[26]

Product Cycle

The Product Cycle Theory, although similar in some respects to the Technological Gap Theory, views comparative advantage as a sequential movement through time. Essentially, the product-cycle theory relates changing comparative advantage to the evolving standardization of a product as it moves through three stages of development; namely, (1) new product, (2) maturing product, and (3) standardized product.

The product-cycle model can, presumably, by considering the evolution of a product through the production process, illustrate which inputs of production become the comparative advantage during the process of a product's sequential movement. Vernon (1967) illustrated the changing nature of comparative advantage in the product cycle by analyzing the production and market requirement in the new product stage.[29]

FOOTNOTES TO CHAPTER I

[1] E. Heckscher, "The Effect of Foreign Trade in the Distribution of Income" (1919), Ellis & Metzler (Eds.) reproduced in *Readings in the Theory of International Trade* (Philadelphia: The Blakiston Company, 1956), pp. 272-300 and B. Ohlin, *International and Inter-regional Trade* (Cambridge: Harvard University Press, 1933).

[2] Donald R. Sherk, "The New International Trade Models and Their Relevance for Developing Asia." *Malyan Economic Review*. Vol. 13-14, October, 1968-1969, p. 6.

[3] See Wassily Leontief, "Domestic Production and Foreign Trade: The American Capital Position Re-examined." *Proceedings of the American Philosophical Society*, Vol. 97, No. 4, September 1953; and "Factor Proportions and the Structure of American Trade: Further Theoretical and Empirical Evidence", *Review of Economics and Statistics*, Vol. XXXVIII, No. 4, 1956.

[4] *Op. cit*., p. 6.

[5] S. B. Linter. *An Essay on Trade and Transformation*. (New York: Wiley, 1961).

[6] See Giorgio Basevi, "Domestic Demand and Ability to Export". *Journal of Political Economy*, March-April, 1970, 78(2). p. 330.

[7] *Ibid*., p. 336.

[8] *Ibid*., p. 336.

[9] *Ibid*., p. 330.

[10] R. C. Hsu, "Changing Domestic Demand and Ability to Export." *Journal of Political Economy*. January-February 1972, 80(1), pp. 198-202.

[11] *Ibid*., p. 198.

[12] *Ibid*., p. 198.

[13] It should be noted the Hsu's work is stated without empirical support.

[14] _Op_. _cit_., p. 200.

[15] _Op_. _cit_., p. 200.

[16] _Op_. _cit_., p. 201.

[17] _Op_. _cit_., p. 201.

[18] Helen Waehrer, "Wage Rates, Labor Skills and United States Foreign Trade", in _The Open Economy_ (New York: Columbia University Press, 1968), pp. 213-239.

[19] Irving Kravis, "Wages and Foreign Trade", _Review of Economics and Statistics_, February 1956.

[20] See _op_. _cit_., p. 8.

[21] _Op_. _cit_., p. 8.

[22] M. V. Posner, "International Trade and Technical Change", _Oxford Economic Papers_, N-S 13, October 1961, pp. 323-341.

[23] C. C. Hufbauer, _Synthetic Materials and the Theory of International Trade_. (London: Duckworth, 1965).

[24] D. B. Keesing, "The Impact of R & D on the United States Trade", _Journal of Political Economy_, 75 February 1967, pp. 38-48.

[25] W. Gruber, D. Mehta and R. Vernon, "The R & D Factor in International Trade and International Investment of the United States Industries", _Journal of Political Economy_. 75 February 1967, pp. 20-37.

[26] _Op_. _cit_., p. 12.

[27] J. Drize, "Quelques réflexions sereines sur l'adaptation de l'industrie belge au Marché Commun." Comptes rendus des travaux de la soc. Royale d' Econ. Polit. de Belgique, No. 275, December 1960.

[28] *Op*. *cit*., p. 330.

[29] *Op*. *cit*., pp. 20-37.

CHAPTER II

STATEMENT OF HYPOTHESES

Origin of Hypotheses

The impetus for the hypotheses orginate from a well-known author in the field of marketing, George W. Robbins,[1] who stated:

> The superficial explanation posed by the surplus hypothesis is to be found in the contemporary and popular notion that foreign trade exists because of surpluses resulting from division of labor when in fact it is quite the other way around.2

Within his statement Robbins deals with two hypotheses of trade. The first hypothesis is that trade is caused by surpluses arising from the division of labor and the second he states, while discounting the first, is that trade is caused by demand and division of labor.

Robbins discusses the concepts and origins of trading from a historical perspective when he suggests that trade occurred within primitive societies because of demand and division of labor. He elaborates by suggesting that one group of individuals may make baskets more efficiently than another group makes pots; hence, the former group trades baskets for the latter group's pots.

However, Robbins' hypothesis that trade occurs because of demand and division of labor is contradicted by the fact that trade is two-sided. In other words, not only does trade require a demand but it also requires a supply. It would seem, then, that Robbins prima facie case for the reasons for trade are at best doubtful.

The hypotheses are taken from Robbins' statement because he offers only opinions about the origins of trade which are unsupported by empirical analysis. At this juncture, it would be convenient to tentatively state the hypotheses in the following manner:

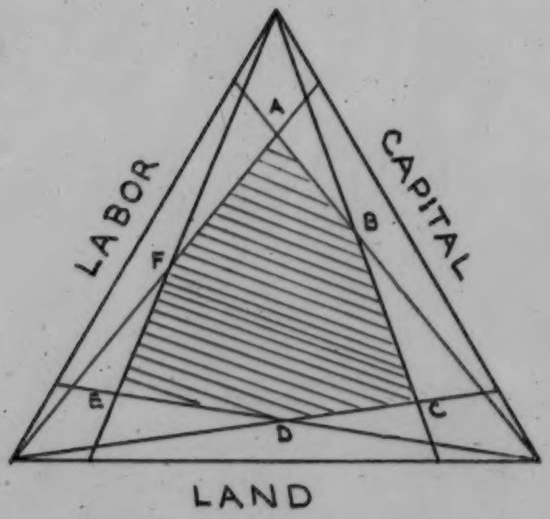
(1) Trade is caused by demand arising from division of labor.

(2) Trade is caused by supply arising from division of labor.

However, a study of the above hypotheses would be premature and would, in all probability, provide only superficial results. This is because of Robbins historical perspective on trade and his concept of division of labor. The historical orientation in explaining the development of trade is inadequate in a modern context because of its simplicity with respect to the complexity of world trade as it presently exists. The notion of primitive division of labor must be updated to provide a more modern perspective. Thus, for the purpose of this thesis, the national and international asepcts of division of labor must be considered.

On a national scale, "division of labor" is limited by the extent of the market. Where division of labor is the specialization of product lines, or alternatively, the specialization of labor for making an individual product. To a certain extent, division of labor is limited by the availability of resources in an economy, such as raw materials, capital and labor. For example, consider three basic factors of production: land, labor and capital. These factors are represented schematically in Figure 1 as a simplified linear program problem.

FIGURE 1



SOURCE: R. F. Spragins

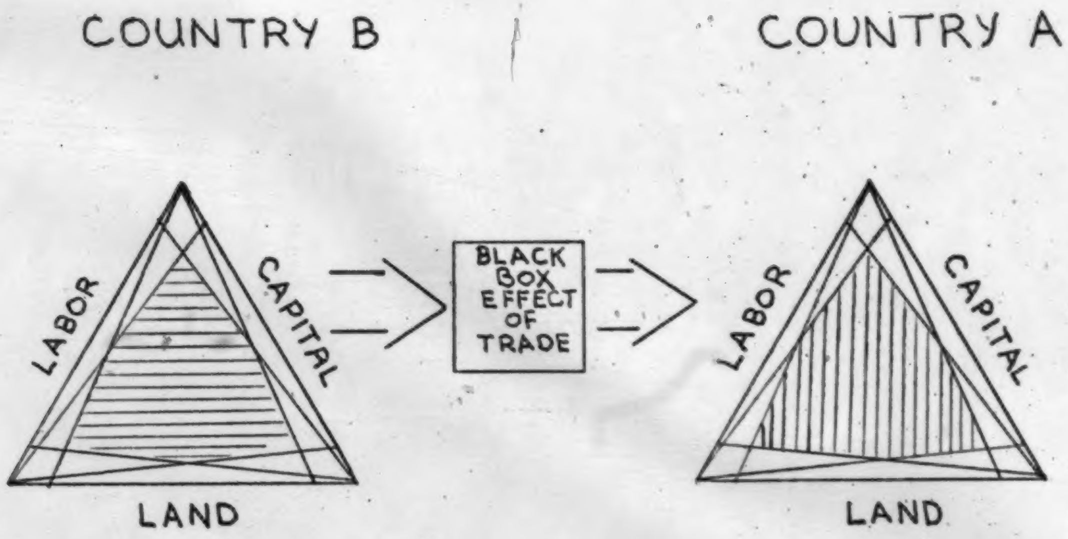
The three factors interact such that a domestic possibility set for goods and services is represented by the shaded area defined as figure BACDEF. This shaded area illustrates the total domestic production of an economy where a certain portion will be for export. Alternatively, domestic production may not be sufficient for the necessary level of domestic consumption, requiring that a certain quantity of goods or services be imported.

Clearly, when considering the total national economy, division of labor is limited not only by the extent of the market, but also by the availability of economic resources which may effectively be utilized.

Professor Robbins' view of division of labor tends to be micro-economic rather than macro-economic and it becomes necessary to consider the second aspect of division of labor which is its international content.

On a global scale, different variables will interact between countries desiring to trade, which will either promote or reduce the incentive to trade. Some of these variables might include: transportation costs, tariff rates, quotas, taxes, and exchange rates to name only a few. Figure 1 may now be expanded to illustrate a simplified trading relationship between two countries and the international aspects of division of labor.

FIGURE 2



SOURCE: F. Spragins

From Figure 2, assume that country A cannot produce enough of a particular product, say widgets, and therefore must import them to supplement domestic production. Country B is willing to provide the required amount of widgets to Country A. Because of the "Black Box Effect of Trade", Countries A and B are able to arrive at some mutual agreement where Country B will export widgets and Country A will import them at some specified exchange rate, tariff structure and so on.

Unfortunately, the economic nature of division of labor is not adequate for designing a model of international trade because it is primarily a micro approach to analyzing conditions existing within a national economic system and not readily applicable to countries in the international environment. Recognizing such an inadequacy, the purpose of the discussion has been to provide the basis for transforming the economic concept of division of labor to a marketing concept which may be used in designing a model of international trade. Therefore, rather than considering division of labor in its pure economic form, this portion of the hypotheses will be excluded and in its place indicators of economic activity and performance, both domestic and international, shall be substituted.

The Final Research Hypotheses

Research Hypothesis I

Trade is caused by Demand influenced by Indicators of Economic Activity.

Research Hypothesis II

Trade is caused by Supply influenced by Indicators of Economic Activity.

where

(1) Demand is similar to imports of a country.

(2) Supply is similar to exports of a country.

In order to expedite analysis of the hypotheses, a corollary will be added.

Corollary

> An indicator of Economic Activity is a sufficient but not a necessary condition for the occurrence of international trade.

The purpose of the corollary is to add some latitude for flexibility when interpreting the empirical results and for accepting or rejecting the final hypotheses. The hypotheses without the corollary will be considered Strong Form Hypotheses and the hypotheses with the corollary addition will be considered Weak Form Hypotheses.

The addition of the corollary is necessary because a number of variables will be considered which represent different measurements of economic activity. Any one of these variables, singularly or in association, may or may not have an effect on a possible relationship existing between trading countries.

FOOTNOTES TO CHAPTER II

[1] George W. Robbins, "Notions About the Origins of Trading," reprinted in Marketing Channels: A Systems Viewpoint. Mollar & Wileman (eds.) (Homewood: Richard D. Irwin, Inc., 1971).

[2] Ibid., p. 11.

[3] R. A. Samuelson and A. Scott, Economics: An Introductory Analysis. (Toronto: McGraw-Hill Co. of Canada Ltd., 1968), pp. 66-67.

[4] Ibid., p. 68.

CHAPTER III

DESIGN AND THEORY OF THE MODEL

Assumptions

When considering a subject of such complexity as international trade, it becomes necessary that a model or theory be designed upon a basis of assumptions. Some of the assumptions are rigorous while others are not and may eventually be relaxed. The necessity of formulating assumptions is apparent when one realizes that the multitude of possible variables that may be considered in an analysis create a labryinth of related and non-related variables. The task of deciphering and interpreting the cause and effect relationships in a model consisting of a large number of variables would at best be monumental if not impossible. Thus, it will be desirable to ultimately have as simple a model as possible where the intent is to optimize its explanatory power.

Equilibrium conditions. Countries engaging in international trade will either produce a given quantity of a product of which a certain portion is for export or they will supplement domestic consumption by importing products from other countries.

If any given country increases its exports of a product to another country, it will create a condition in the world where the exports of all other countries, for that product, will be reduced. The equilibrium condition among the affected countries is compensated for by readjustments of international variables such as the exchange rate and tariffs. The readjustment of these factors plus many others, allows the affected countries to return to the equilibrium condition. When the international economic environment readjusts to equilibrium conditions, the country that originally increased its exports now competes on the same basis as before it increased exports.

No barriers to trade. In an effort to keep the model as simple as possible, no exogenous or endogenous variables such as taxes, transportation costs, quotas and tariffs are to be considered. Information and communication do not constitute barriers to trade. Furthermore, it is assumed that trade exists without political interference.

Consumer preferences. Consumer preferences and tastes are assumed to be given.

Multicountry model and one product. The eleven countries: Canada, United Kingdom, Belgium-Luxembourg, Denmark, France, West Germany, Italy, Netherlands, Sweden, Switzerland and United States trade one product: automobiles. The above countries, excluding Canada, were selected because they have a trading history with Canada in automobiles that spans a period of eighteen years. The selected countries have relatively mature economies which support a manufacturing or assembling industry. Automobiles were chosen as the traded product primarily by default because it was one of the few durable products requiring an industrial base that has been produced by the eleven countries over a period of time.

Limitations

Data. For the purposes of this paper, indicators of Economic Activity shall be defined to consist of the following variables: Export Value, Import Value, Balance of Trade #1 (exports less imports of automobiles), Balance of Trade #2 (total exports less imports, F.O.B.), Gross Domestic Product, Gross National Product, National Income, Private Consumption, Exchange Rate, International Reserves, Bank Rate, Population, Labor and Capital.

The above variables were selected after a review of international trade literature and have either a strong theoretical base in economics or marketing to justify inclusion. The variables cover a time period of eighteen years, from 1956 to 1973. Sources of data for the variables originate from the following publications: Statistics Canada,[1] International Monetary Fund,[2] and International Labor Office.[3] (see Appendix I for a listing of data.) A more concise discussion of the different variables will be undertaken further on in this chapter.

No doubt there are other important variables which may have been omitted; however, additional variables would tend to unnecessarily complicate the model design even though the explanatory power of the model may be increased. However, the adequacy of variable selection shall be determined during the course of the analysis.

Missing Data Observations

Because of irregular or inconsistent reporting, some lapses of data have occurred. These missing data observations have been estimated according to generally accepted methods of interpolation and extrapolation (see Appendix II for methods of estimating data points and a listing of the estimated data observations).

Contaminated Data

Over time, definitions of the variables used by Statistics Canada, IMF and ILO may change, requiring readjustments in the method of calculation. The redefinition of variables may cause the data series to lose some of its homogeneous character. If this is in fact the case, it will become evident in the data analysis.

Statistical. The small number of data observations may create difficulty in accepting or rejecting results primarily because of TYPE I statistical errors. The small number of observations associated with a large number of variables creates difficulty in the use of certain computer programs. Programs such as MULU10, which is used to compare covariance matrices, requires a large number of degrees of freedom which are not available in the eighteen-by-fourteen (18x14) data matrix.

Other limitations arising from the small data sample are concerned with manipulations of the data. For example, each instance where an observation is lost through differencing, interpretation of results will become increasingly difficult.

Methodology

Formulation of hypotheses.

The first task in the writing of this thesis was to begin with two hypotheses which formed the basic foundation of the research. The hypotheses, being in a historical perspective, were updated to provide a modern marketing orientation. Once the hypotheses were formulated, definitions were developed and then a research study was undertaken to select the variables which were used in the model design. Research and data collection were limited to a library search.

Data manipulations.

A research study undertaken by Spragins (1975)[4] showed that all variables in a model, similar to the one developed in this paper, were highly correlated as a function of time (see Appendix IV.) A regression study provided further evidence that there was a high correlation between dependent and independent variables, also for the above reason. Because variables are highly correlated over time, the true relationship between variables was not apparent. In order to circumvent this problem, it was necessary to induce stationarity by taking the first difference of the data and converting observations to natural logs (see Appendix III for first difference and natural log computer programs).

Statistical techniques. The following statistical methods were used to analyze data: covariance analysis, factor analysis, factor scores and regression analysis.

Theoretical Design of the Model

Pursuant to the hypotheses developed in Chapter II, two models of trade will be formulated. The first model of trade deals with exports, where the export quantity is a function of Indicators of Economic Activity. The second model of trade deals with imports, where the import quantity is a function of Indicators of Economic Activity. Two models are developed because trade is a two-sided transaction requiring a purchase and a sale, where exports represent the sale and imports represent the purchase between two countries.

The problem presented in the development of the models is to determine Canada's aggregate trading relationship with ten countries and ten countries individual trading relationships with Canada. See Figures 3 and 4.

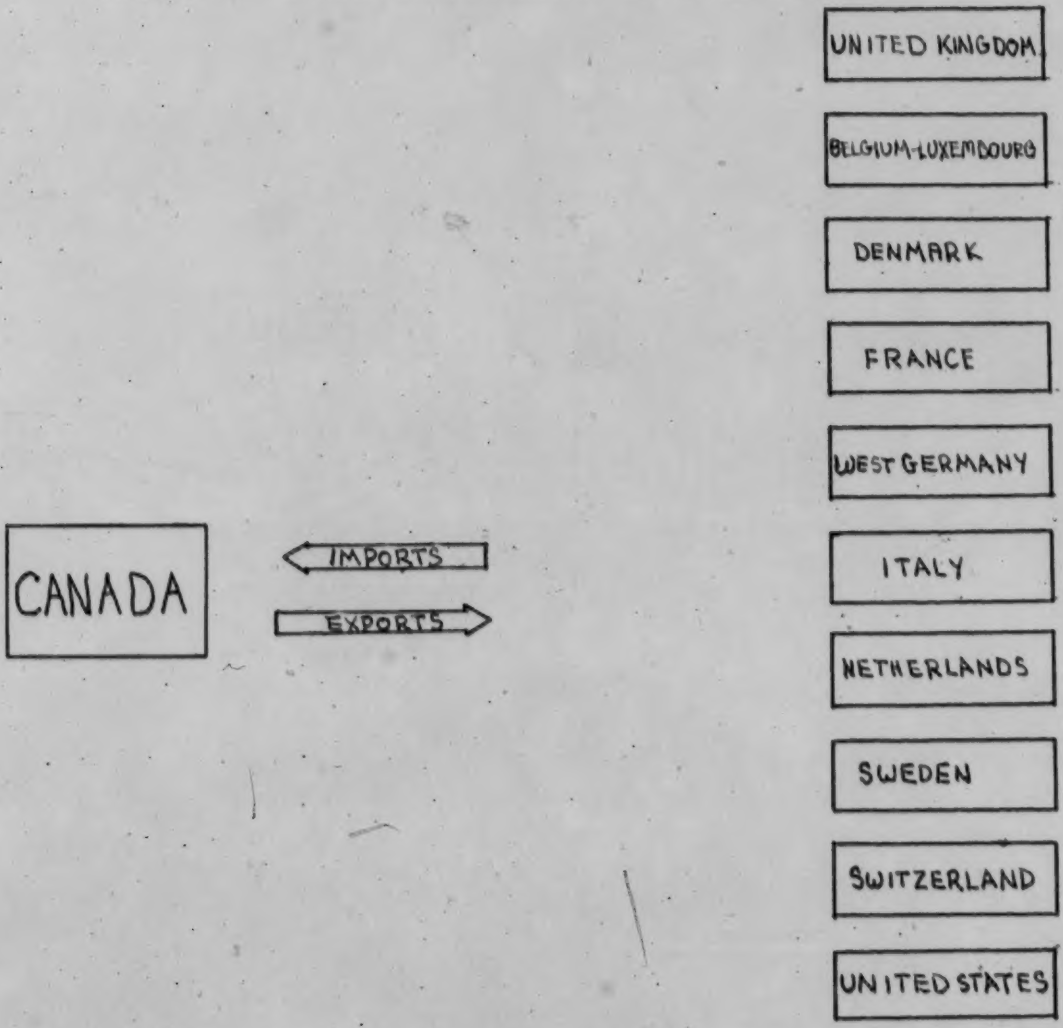
Figures 5 to 15 illustrate the changing export and import curves for all countries in the models over an eighteen-year period.

Indicators of Economic Activity

The primary problem in the model design is to develop a workable explanation of Indicators of Economic Activity. Once this has been accomplished,the results will be used in a regression analysis to determine if a mathematical relationship exists between Indicators of Economic Activity and exports and imports of automobiles. For the purpose of this paper, Indicators of Economic Activity shall be composed of fourteen variables which will now be discussed.

FIGURE 3

CANADA'S TRADING RELATIONSHIP WITH TEN COUNTRIES*



---

*Figure represents the aggregate exports and imports of Canada from ten countries.

SOURCE: R. F. Spragins

FIGURE 4

TEN COUNTRIES TRADING RELATIONSHIP WITH CANADA*

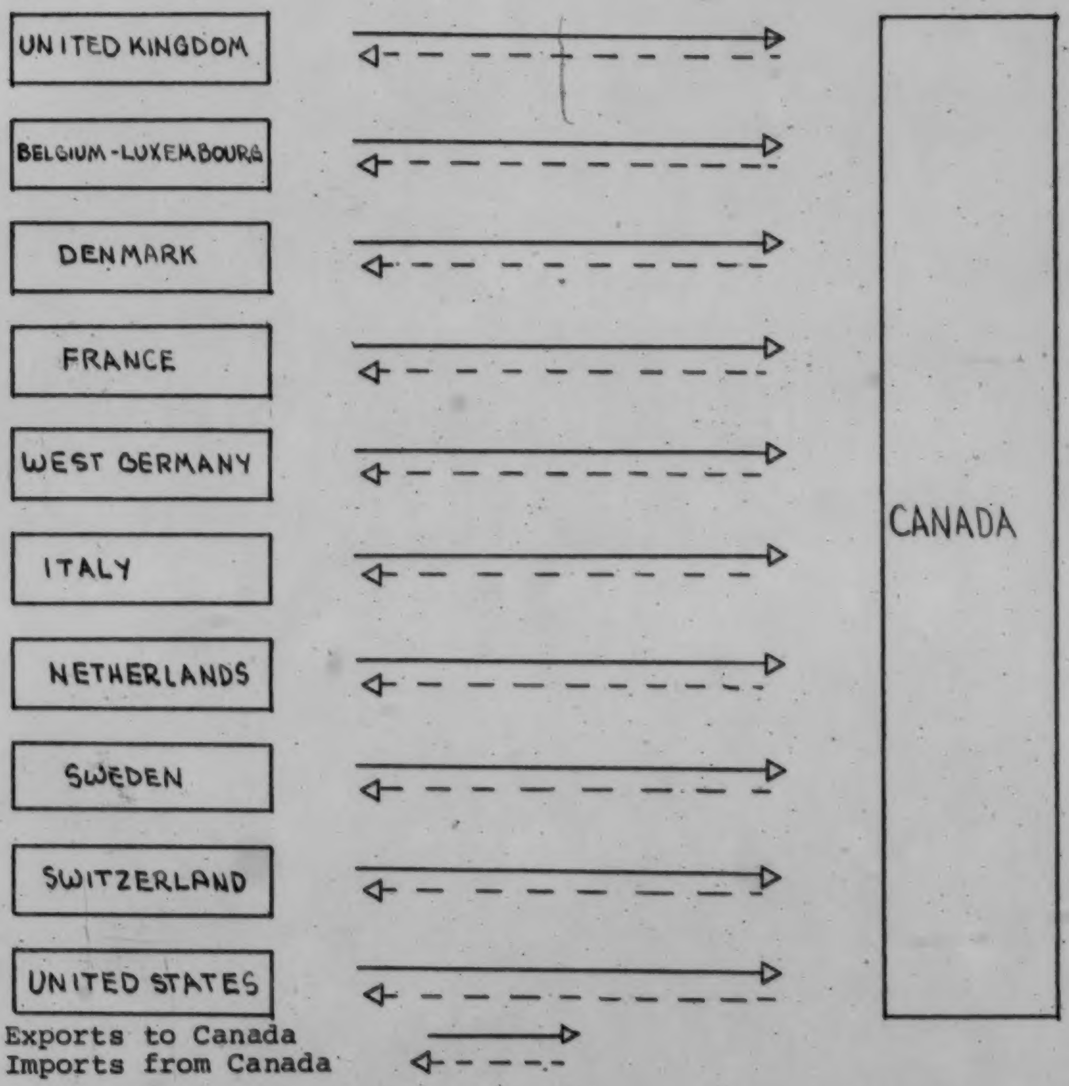


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*Figure represents the individual exports and imports with Canada for ten countries.

SOURCE: R. F. Spragins

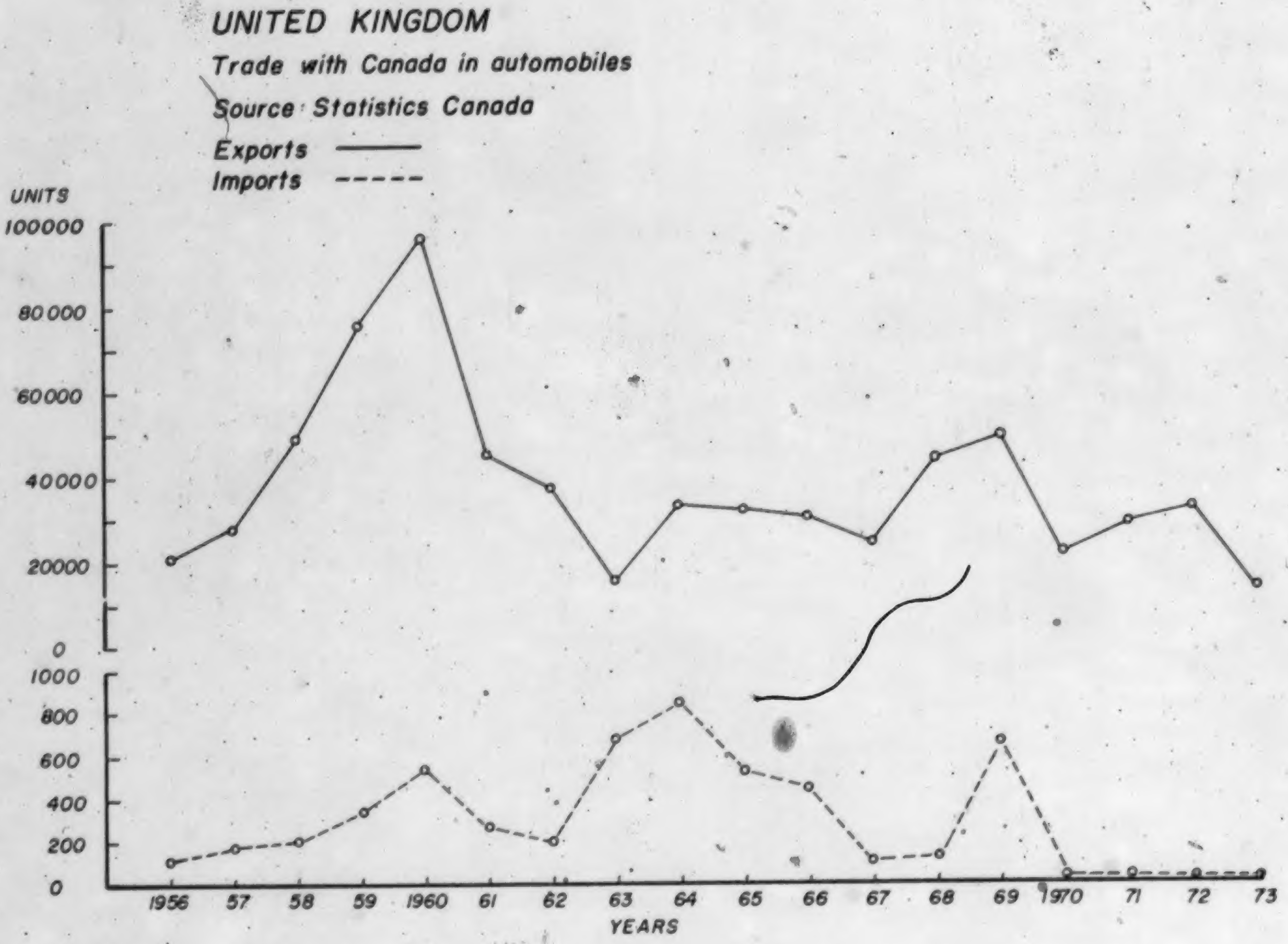

FIGURE 5 United Kingdom

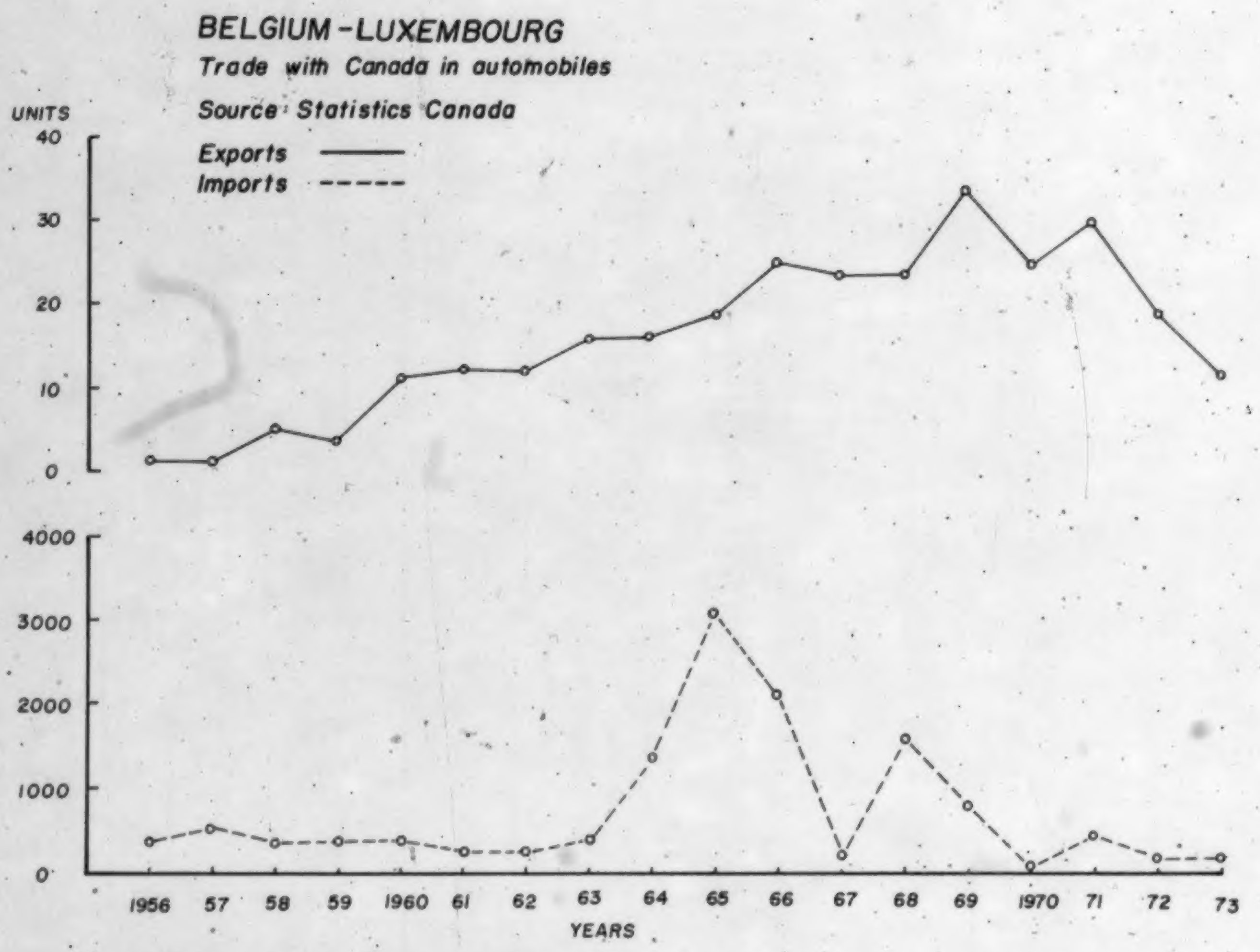

FIGURE 6 Belgium Luxembourg

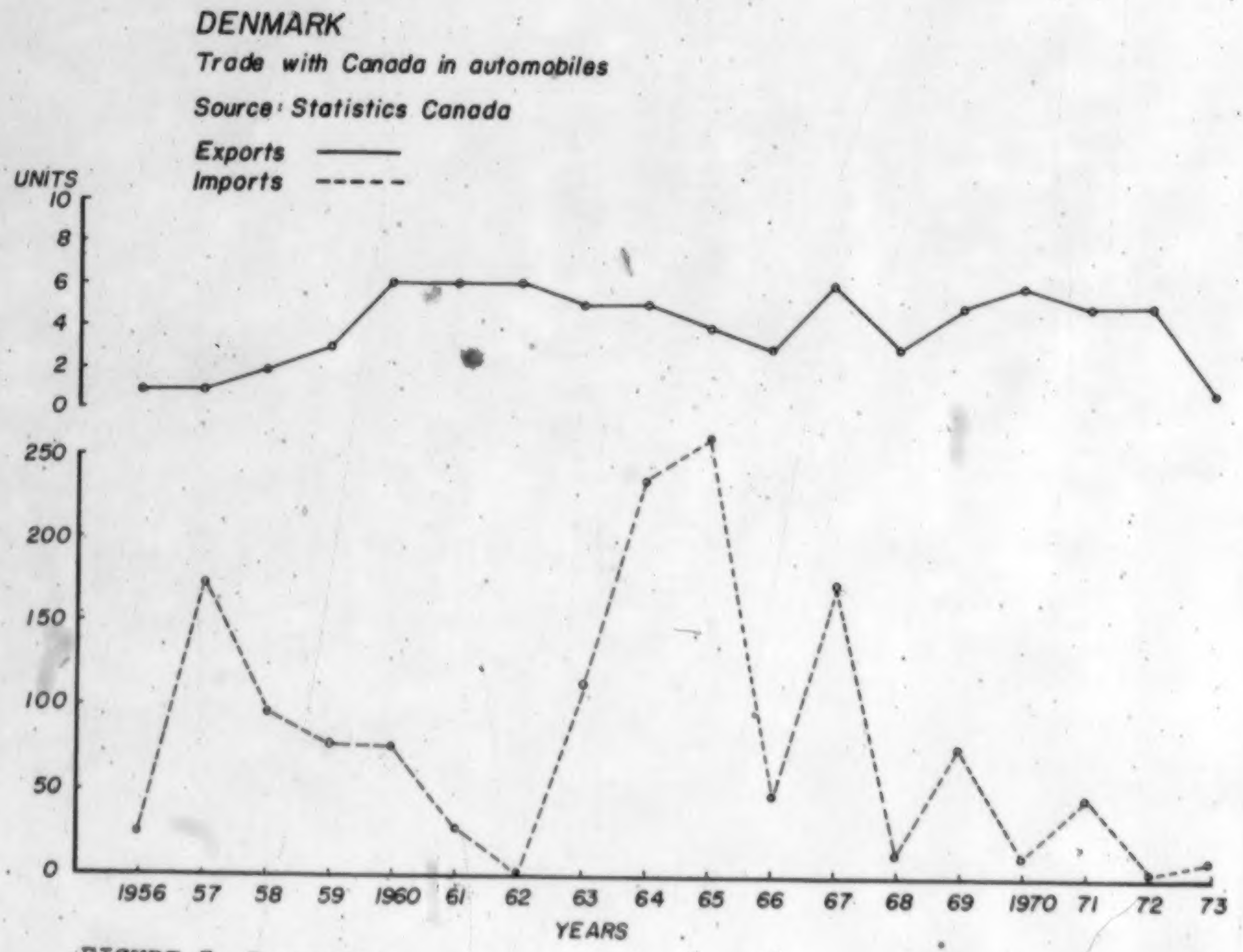

FIGURE 7 Denmark

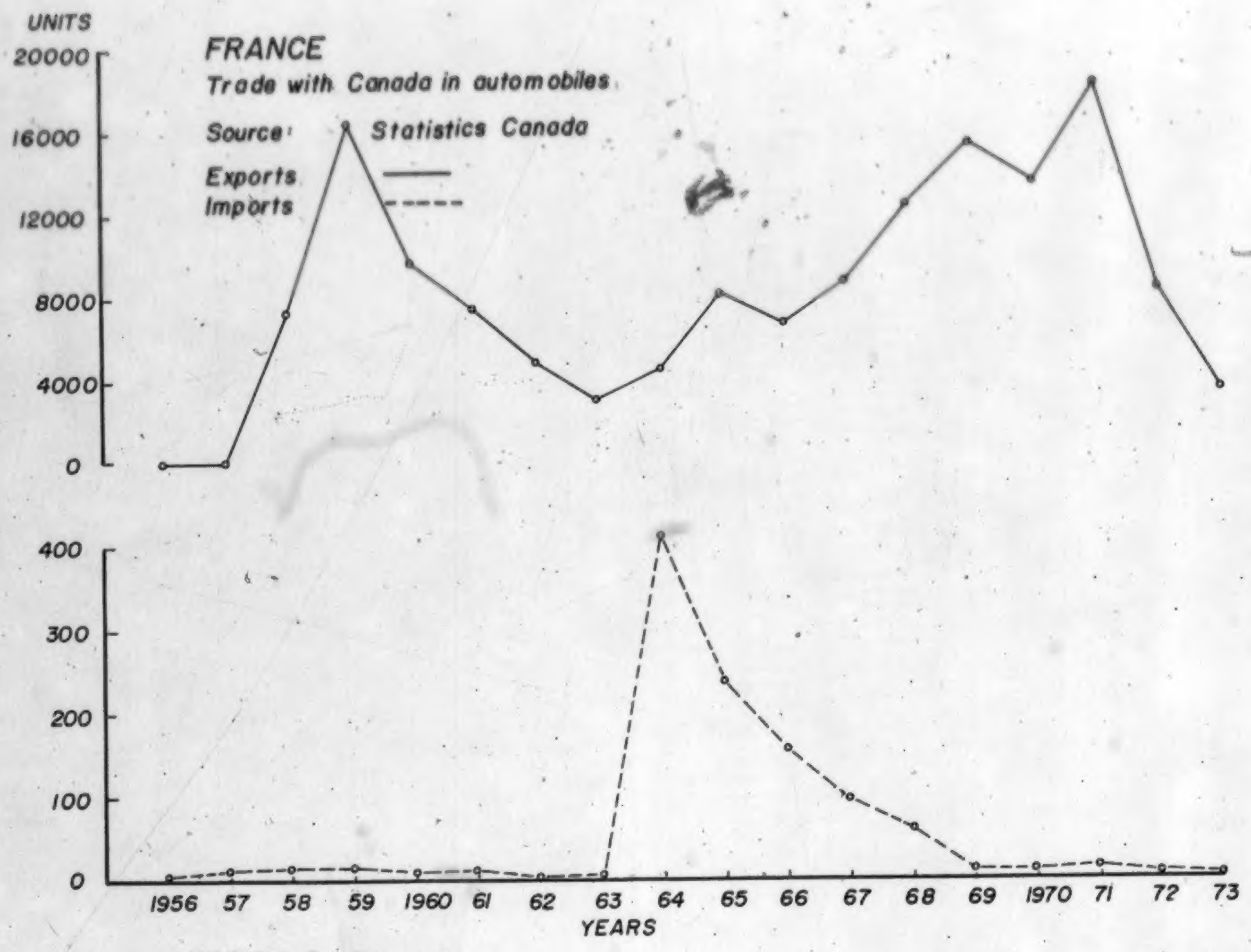

FIGURE 8 France

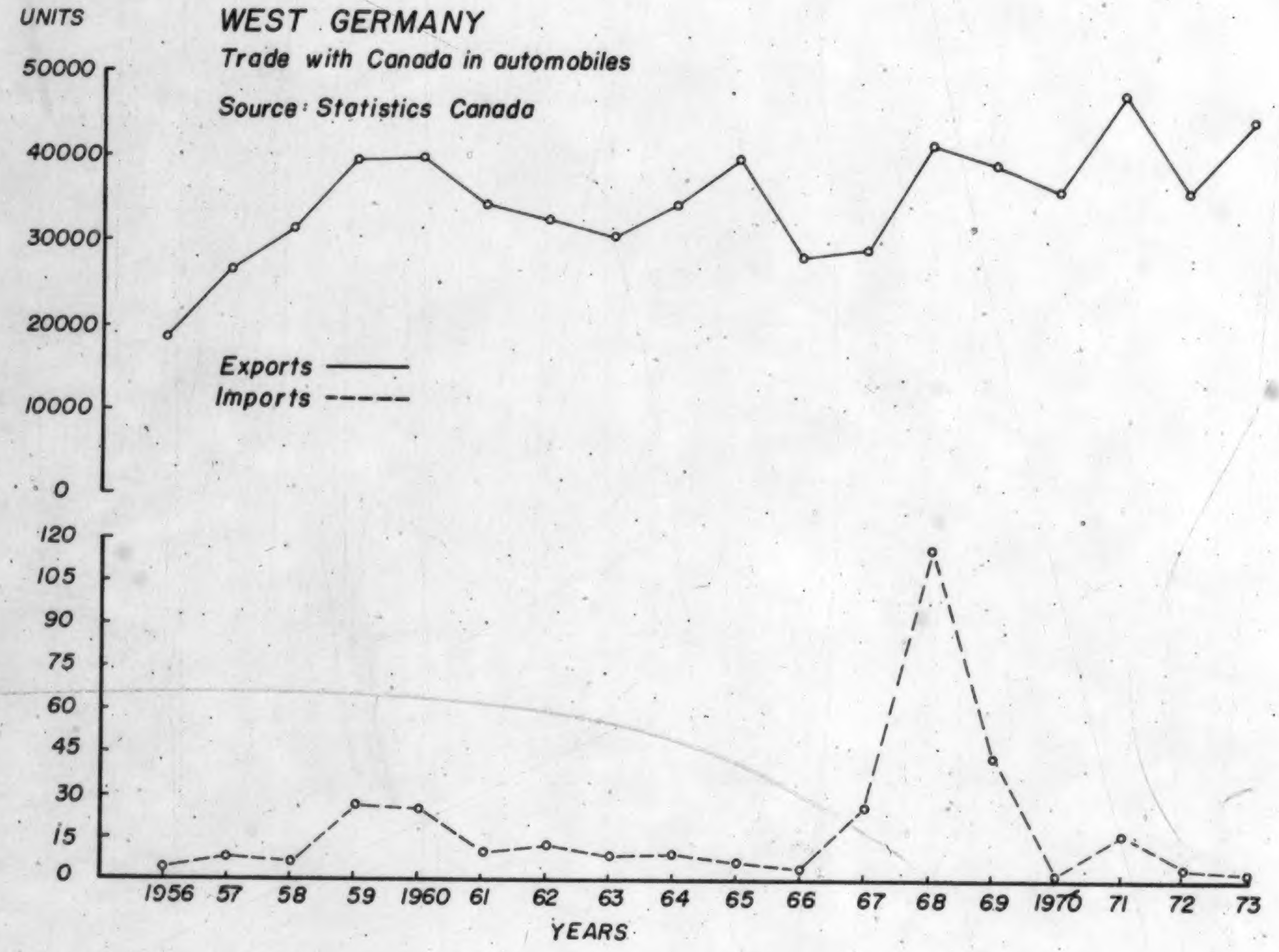

FIGURE 9 West Germany

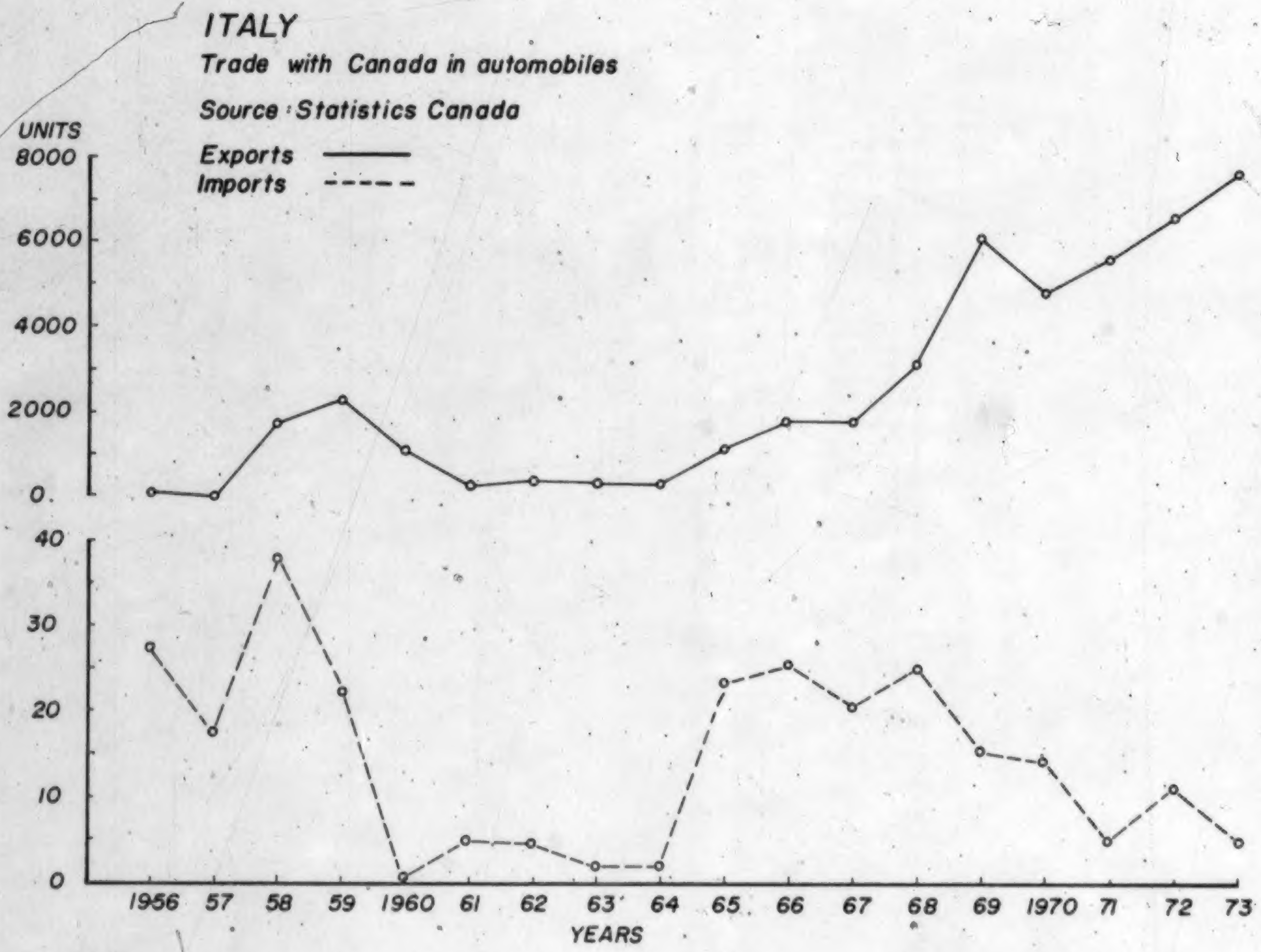

FIGURE 10 Italy

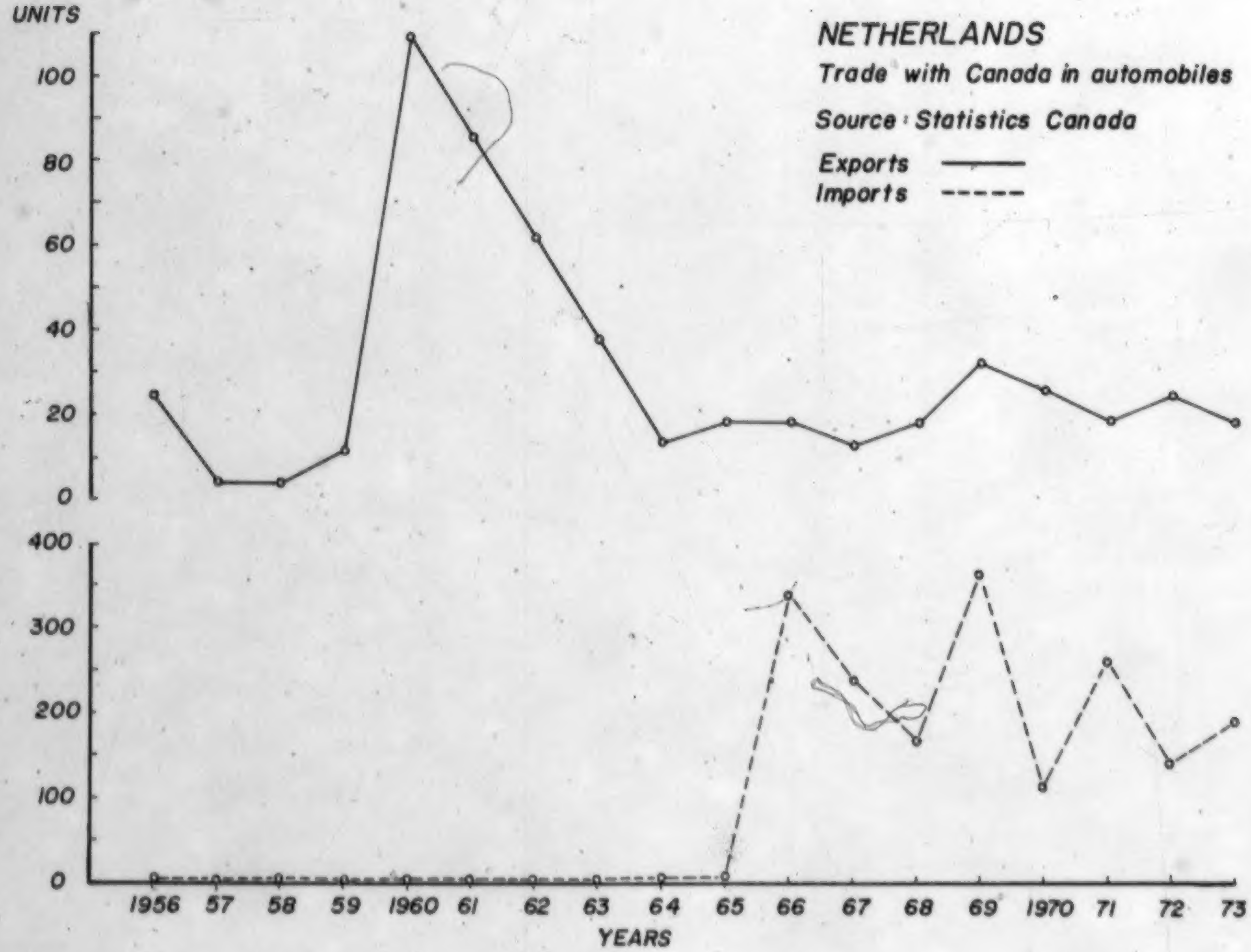

FIGURE 11 Netherlands

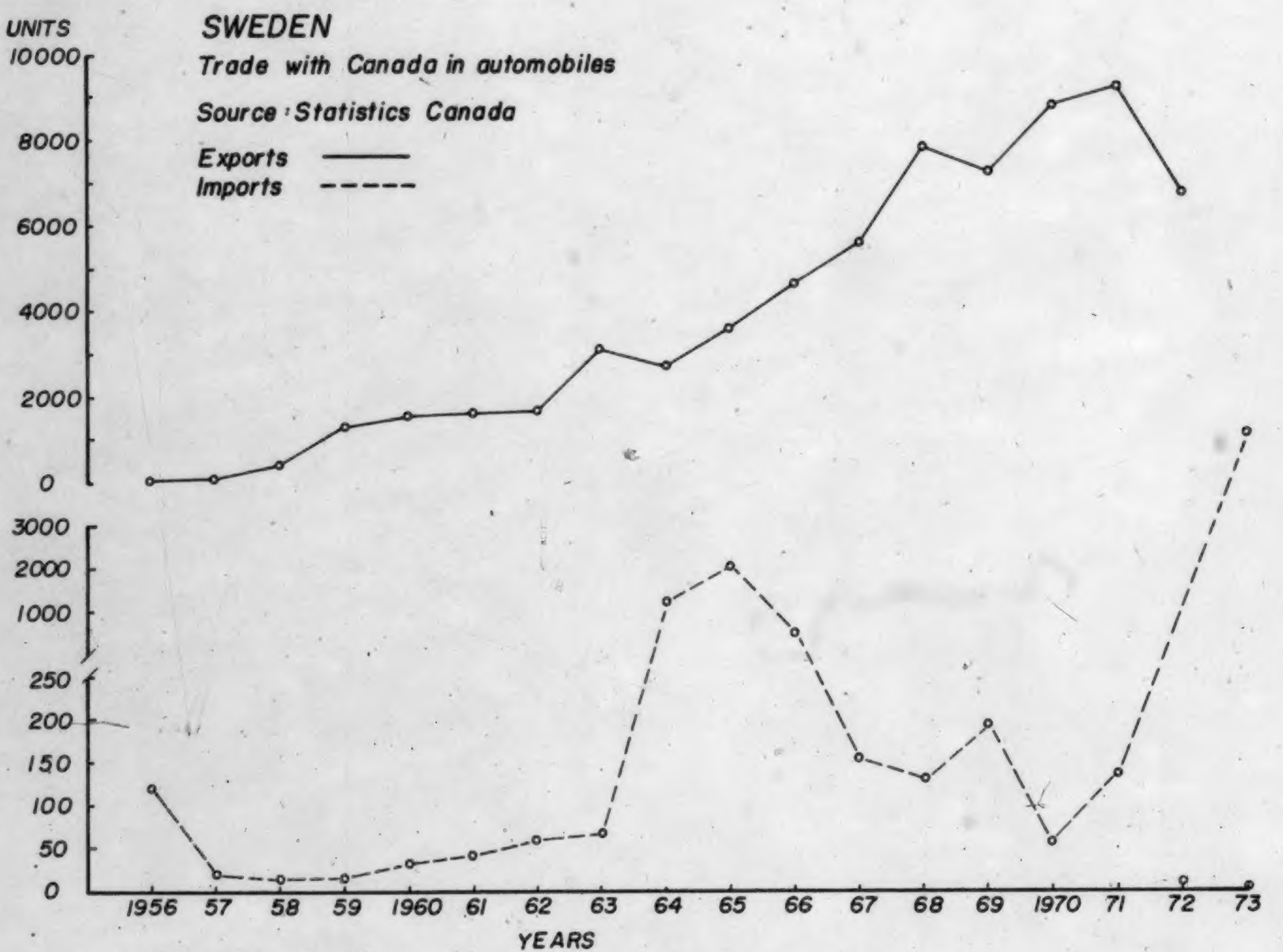

FIGURE 12 Sweden

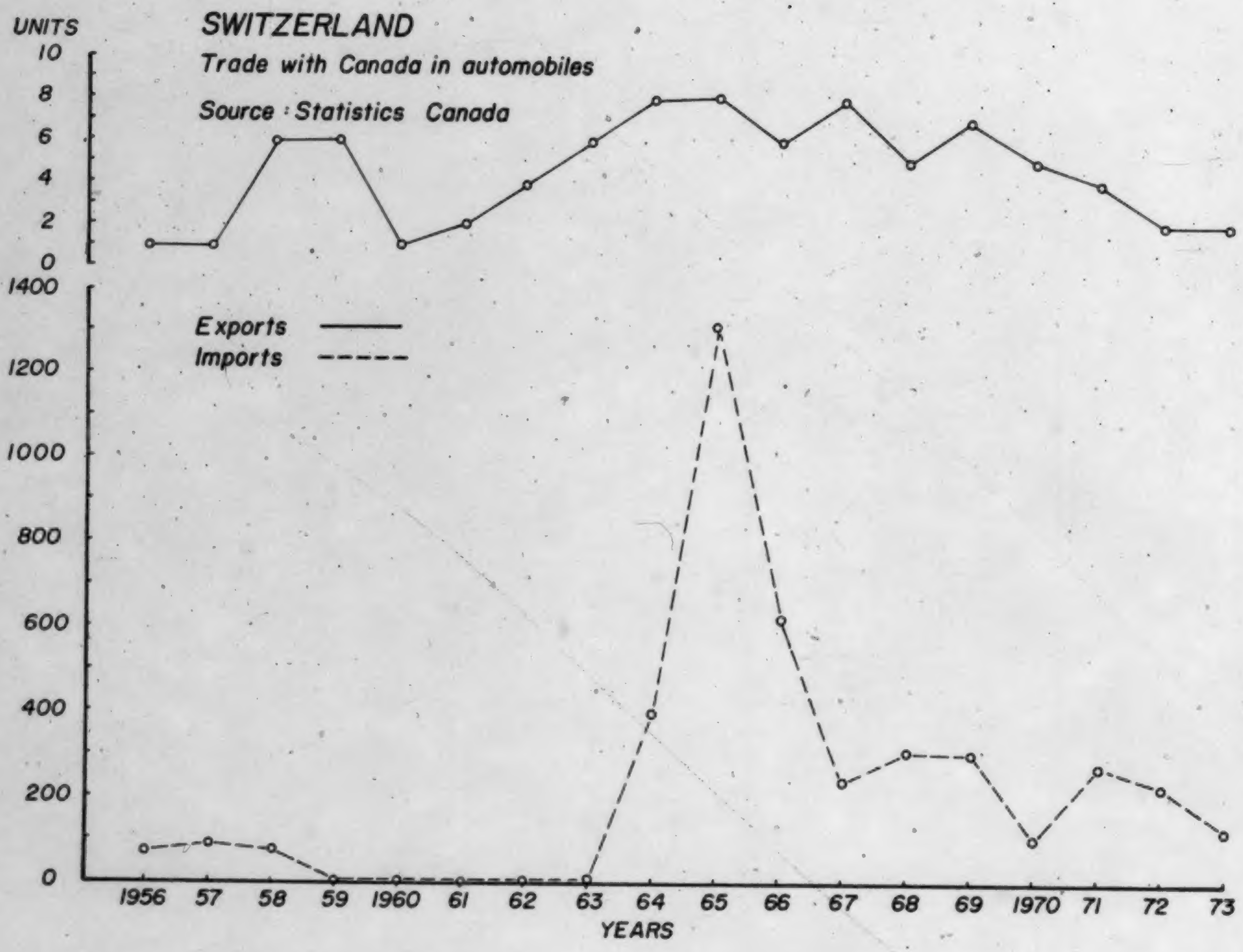

FIGURE 13 Switzerland

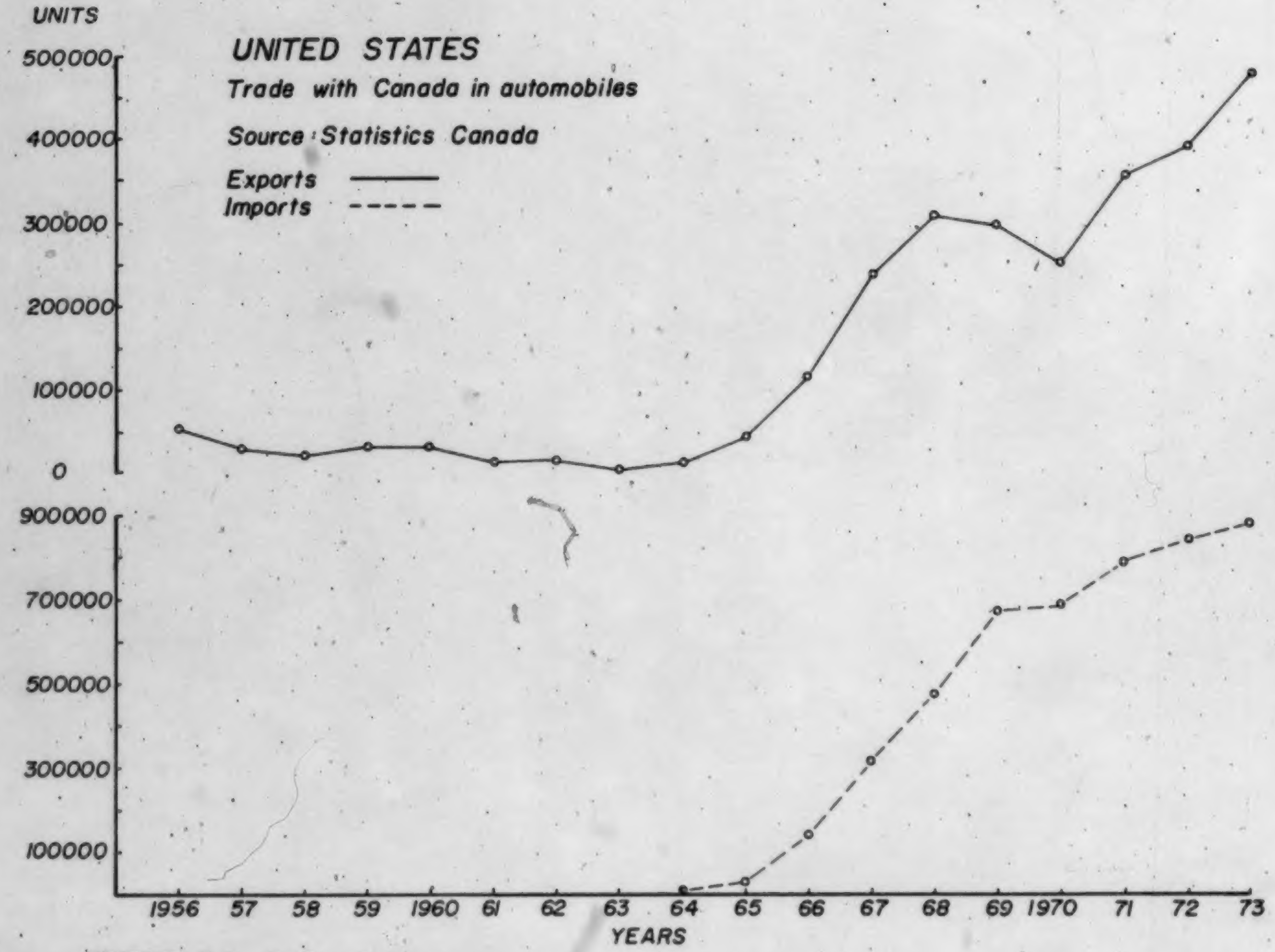

FIGURE 14 United States

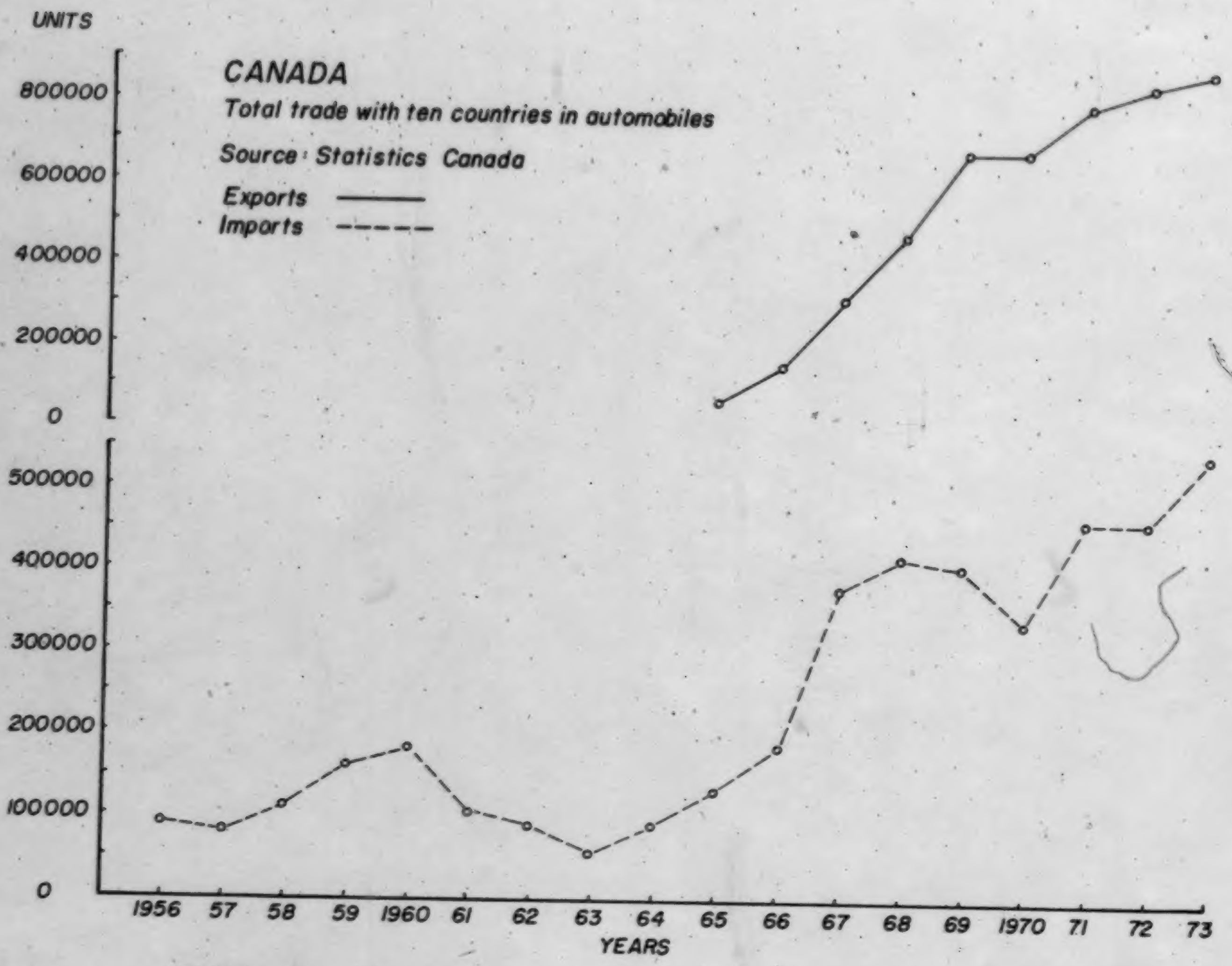

FIGURE 15. Canada

Export value. The total dollar value of all automobiles exported annually by the countries in the model. Export value is included in the model to determine whether or not a relationship exists with other variables in the model. From a marketing perspective, it will be desirable to ascertain whether a relationship exists between the value of automobiles and the quantity of automobiles exported to another country. For example, in some countries where the levels of income and consumption are higher in a relative sense than other countries, the value of automobiles may not be a deciding factor for a purchase. Alternatively, for the other countries, the value of an automobile may be a deciding factor in whether or not a transaction takes place.

Import value. The total dollar value of all automobiles imported by countries in the models. The import value of automobiles is included for similar reasons as the export value.

Balance of trade #1. This variable represents the difference in value of exports, less imports, of automobiles annually for each country

Balance of Trade in automobiles is included because it is desirable to provide the marketer with an indication of a country's position in terms of its domestic level of production. In other words, is the country a net exporter or a net importer of automobiles?

Consideration of a country's Balance of Trade in automobiles is important to the marketer because it provides some information as to whether the market is accessible by importing automobiles or if it produces sufficient quantities to satisfy domestic demand and therefore may be inaccessible.

Balance of trade #2. The total value of all exports, less imports, F.O.B., for each country annually.

The major reason for including this variable in the model is that it is desirable to have an indicator of a country's trade position vis-a-vis other countries in the world. It will also be useful to determine if a relationship exists between the total balance of trade and other variables in the model and what a possible relationship might mean to the international marketer.

The total balance of trade position of a country is important to the marketer because if governments of countries attempt to alter their total trade position with respect to other countries in the world, it could have the effect of encouraging or discouraging international trade.

Gross National Product. Gross National Product is equal to the sum of final products such as consumption and gross investment (which is the sum of the increase in inventories and gross births, or production of buildings and equipment).[6] On a per capita basis, many economicsts view G.N.P. as a surtogate measure of economic well-being.

For the marketer, the level of G.N.P. in a country may have a significant relationship to the quantity of automobiles that are exported or imported. Tentatively, it will be suggested that if a country is above a certain level of G.N.P., it will be able to export or import automobiles; however, if a country is below some specified level of G.N.P., it will be able to export or import automobiles only on a limited scale.

In an economic context, Professors Samuelson and Scott have stated that, "in an open economy like Canada's, changes in national income can often be traced back to changes in exports or imports."[7,8]

Gross domestic product. Gross Domestic Product is equal to G.N.P. less the value of exports or the level of production which is for domestic use only. "Gross National Product is the summary of the revenues from domestic production of finished goods and services."[9]

Because G.D.P. is a component part of G.N.P. a high degree of multicollinearity exists between the two variables. However, G.D.P. is included in the model design for two reasons. The first reason is to determine which variable has the greatest explanatory power in terms of the percentage of variance each can account for in a mathematical relationship. The second reason is to determine if a relationship exists between the level of domestic production and exports and imports.

For example, if the elasticity coefficient of G.D.P. is greater than 1 in the export model, then it might be assumed that changes in export quantity would be related to changes in G.D.P. On the other hand, if the elasticity coefficient is less than 1 for G.D.P., the relationship would be proportionately less.

The above information, if verified by the model, would provide valuable information to a marketer who is attempting to decide if the productive capacity of a country is sufficient enough to satisfy domestic requirements.

National income. "National Income includes all incomes earned. It includes wages, rent, interest and profit; but also social security payments, corporate profits taxes, and retained corporate earnings."[10]

"The national income is a concept of fundamental importance; it represents for the economy as a whole the amount of income earned by the owners of economic resources (land, labor and capital) in return for supplying the services of these resources to the productive units of the economy."[11] "The national income is both a measure of product (in the sense that it represents the factor cost of the current output) and a measure of money income earned by the factors of production."[12]

National Income, being a component part of Gross National Product, will have a significant relationship with G.N.P. because of the multicollearity existing between the two variables. Nevertheless, National Income has been included in the model design for reasons similar to those discussed under Gross Domestic Product.

Private consumption. "Consumption is held to be a function of disposable income."[13] Generally, the level of private consumption in an economy is determined by the level of income. When there is a rise in the level of income, there is a proportionate rise in the levels of consumption and savings. Private consumption in a country represents the total value of monies spent by individuals and private organizations for the purchase of goods and services.

Private consumption offers a great amount of potentially useful information to the international marketer. This information is important because a marketer will be interested in knowing if a proportionate rise in private consumption, measured by its elasticity coefficient, will induce a corresponding rise in the level of exports or imports. Furthermore, does private consumption combine with other variables in the model such as the bank rate of a particular country?

Exchange rate. The exchange rate is that rate at which one country's currency may be exchanged for another country's currency. The rate of exchange between any given two countries is determined each day by supply and demand.

Pearce contends that, "there exists some price at which dollars (i.e., Canadian) can be bought for pounds (i.e. British)."[14] He further states, "that the real terms of trade can be measured by the ratio of prices in one country may be compared to a parallel set of prices in another country via the exchange rate."[15]

Using an example by Pearce,[16] this principle shall be examined by assuming that the ratio of prices of a commodity can be measured in Canadian dollars as

$$\frac{P_1}{P_2} ,$$

and that the parallel prices for a commodity of the United Kingdom can be measured in pounds by the ratio

$$\frac{q_1}{q_2}$$

In order for trade to take place, the currency of one country must be converted into the currency of the other where

e = exchange rate.

Assuming that an agreement between the two countries can be made

$$p_2 = eq_2$$

where the currency of Canada now equals the currency of the United Kingdom.

According to Pearce, there are four possible ways trade may move against Canada.[17] The price ratio, p_1/eq_2 will fall if:

(a) p_2 falls, or

(b) e rises, or

(c) q_2 rises, or

(d) any combination of the above.

Clearly, the exchange rate between two countries has significant ramifications for the international marketer. If, for example, the exchange rate between trading countries is not favorable, the incentive to trade will be reduced.[18]

For the purpose of this thesis, the exchange between Canada and each of the ten countries shall be used. However, in order to prevent a singular matrix in the Canada model, the exchange rate between United States and Canada shall be used.

International reserves. International Reserves are funds created and managed by the International Monetary Fund where the objective is to make it possible for countries with limited foreign reserves to finance short-run and transitional deficits.[19]

Typically, countries that have a large volume of international trade will be able to collect foreign currency from other countries which they in turn use to purchase goods from their trading partners. However, if the volume of trade is not great enough to realize sufficient quantities of foreign currency for a country to import goods, then financing from the International Reserves would allow countries to engage in trade.

The concept of International Reserves for marketing is extremely viable because it opens markets that would otherwise be closed to trade. Thus, the reason for including this variable is primarily to determine if International Reserves play a significant role in allowing countries with relatively small volumes of trade and limited foreign currency to engage in international trade.

Bank rate. The bank rate is that rate of interest which the Bank of Canada (and other Central Banks) charges for loans and advances, and which is varied by the Bank as part of its monetary policy.[20]

The theoretical appeal of using the bank rate in the model design is that it is one of the principal tools used in regulating the activity in a national economy. For example, if the economy is in an inflationary trend, the bank rate may be increased to reduce inflationary action. Conversely, if the economy is in a recessionary trend, the bank rate might be lowered to stimulate activity within the economy.

The marketing rationale for including the bank rate in the model design is because consumers in a country generally finance the purchase of automobiles over several years. For many consumers, the ability to borrow funds, and the availability of money for borrowing purposes, will be regulated by the bank rate. If the bank rate is high, consumers will be discouraged from borrowing funds to finance the purchase of an automobile. Alternatively, the easy accessibility to bank loans because of low bank rates may encourage consumers to finance the purchase of automobiles by borrowing funds.

Population. Population of a country shall be defined as the total number of people considered to be permanent residents.

This variable is included because it represents the total potential market for trading automobiles in each country.

Labor. Labor is defined to be the total employable labor force in a country.

Labor is included in the model to determine if a relationship exists between it and the quantity of automobiles exported and imported. In addition, the labor force of an economy represents that portion of the population who are wage earners and who have the economic resources in the form of income which is used to purchase goods and services.

Capital. For the purpose of this paper, capital shall be defined as the aggregate sum of the following statistics: foreign assets, claims on government, unclassified assets, reserve money (Central Banks), government deposits, reserves (Chartered Banks), claims on government, foreign branch accounts, demand deposits, personal savings deposits, government deposits, foreign currency deposits, domestic credit, money, other assets (net) and total assets (life insurance).

The above definition of capital is intended to be a surrogate measure and is meant to represent the total capital (potential and actual) in use as a factor of production. The surrogate definition of capital is not used in a pure economic context but rather from a marketing perspective.

From an economic view, there are two definitions of capital which have been discussed by Pearce.[21]

> Money capital: is the money required to rent work in progress from some other community already established.
>
> Stock of Capital:
>
> (a) money originally subscribed by shareholders.
>
> (b) the current "value" of work-in-progress and part-worn equipment.
>
> (c) some proper aggregate of maturity time of basic factors in all currently operating processes.
>
> (d) productive processes currently in demand.

Pearce concludes that, "the quantity of capital endowment is the value of equipment and work-in-progress which is adjusted for time."[22]

Clearly, Pearce's definition of capital endowment and the surrogate definition are not similar. Unfortunately, very few countries attempt to calculate a measure of capital stocks because of its great complexity and the fact that economists cannot agree on how the statistic should be calculated. This problem created the necessity of developing a surrogate measure of capital from statistics which were readily available in International Monetary Fund publications. The statistics found in IMF publications essentially represent claims against governments, public and private institutions and individuals. In some cases, the criteria for calculating the measurment of capital vary from one country to another;

however, it is the relationship of capital to other variables in the model and not its precise calculation.

The surrogate measure of capital in the model which is important to determine if a significant relationship exists between the variable and the quantity of goods a country produces for exporting. Alternatively, if the quantity of capital is not sufficient to produce the required amount for domestic requirements, it will be desirable to determine if a significant relationship exists between the surrogate for capital and imports of a country.

Statistical Theory of the Model

Covariance analysis.

Bartlett's Homogeneity Dispersion Test will be used to determine if the covariance matrices of each country are similar.[23] Equivalence testing of covariance matrices is a statistical tool that has seen infrequent use in economic studies. Yet, the advantages of using Bartlett's Test are important for designing a model of trade between many countries. If the covariance analysis shows that countries are similar in terms of their Indicators of Economic Activity, then the data for all countries will be combined so that a set of common factors may be computed for all countries. An additional advantage of using covariance analysis is that the amount of computer time may be significantly reduced.

Factor analysis. The purpose and goal of factor analysis has been stated by Comrey as being

> to isolate constructs that have a great intrinsic value for the purposes of building a science. The purpose of factor analysis is to isolate constructs that can be shown to be superior to others in certain defined ways.24

From Comrey's statement, two important facts are evident. Firstly, it is possible to reduce the original and somewhat unwieldy matrix to something less than the original. The advantage of using factor analysis is in its ability to simplify the research process.

The second rationale for using factor analysis is that it combines variables in a matrix which are 'like' each other or which are highly correlated among themselves.

Regression analysis. The theoretical justification for using regression analysis is that it is the method by which the null hypotheses will be tested.

Further, by utilizing regression analysis it can be determined whether or not a significant mathematical relationship exists between the dependent and independent variables: export and import quantities and Indicators of Economic Activity, respectively. In addition, regression analysis is used to determine which variables in the regression equations are significant.

Two general regression models will be run which include: unlagged and lagged models. The reason for calculating an unlagged model is to determine if a simultaneous relationship exists between the dependent and independent variables.

There are, however, a number of potential problems which might occur and not be evident in an unlagged model. Some of these problems include stock-piling of automobiles and inventory management. Another possible problem which could arise is that European automobiles enter the market at the beginning of a new calendar year whereas domestic automobiles enter the market four months earlier.

Other potential problems may be those of an economic nature where consumers in a country are able to purchase automobiles only over an extended period of time. Because of the demand for automobiles, consumers may be required to order well in advance of production dates.

To compensate for the above problems, one and two year lagged regression models will be computed. The models are structured using a lag model which advances the dependent variable one and two years respectively so that the dependent variable in time period t+1 is compared to the independent variables in time t and the t+2 dependent variables are compared to the independent variables at time t. The dependent variables Y_t and Y_{t+1} do not become independent variables. A previous research study by the author indicated that autocorrelation exists between successive observations of Y and therefore inclusion of Y_t and Y_{t+1} will not be necessary.[25]

Summary

Each of the eleven countries to be studied have two models of trade: Exports and Imports. Model forms before factor analysis:

Export Quantity = f(Export Value, Balance of Trade #1, Balance of Trade #2, Gross Domestic Product, Gross National Product, National Income, Private Consumption, Exchange Rate, International Reserves, Bank Rate, Population, Labor and Capital).

Import Quantity = f(Import Value, Balance of Trade #1, Balance of Trade #2, Gross Domestic Product, Gross National Product, National Income, Private Consumption, Exchange Rate, International Reserves, Bank Rate, Population, Labor and Capital).

Tentatively, structural form of models after factor analysis will be of the form:

Export Quantity = Factor 1 + Factor 2 + . . . + Factor N

Import Quantity = Factor 1 + Factor 2 + . . . + Factor N

The final models will be determined by regression analysis and shall remain unstated until completion of the Data Analysis.

FOOTNOTES TO CHAPTER III

[1] Canada, Statistics Canada, "Exports: Merchandise Trade" and "Imports: Merchandise Trade" in Trade of Canada (Ottawa: The Ministry of Industry, Trade and Commerce, 1956-1973).

[2] International Monetary Fund, International Financial Statistics, 1972 Supplement, 1973 Supplement and Vol. XXCIII, No. 5 (Washington: International Monetary Fund, 1972, 1973 and 1975).

[3] International Labour Office, Year Book of Labour Statistics (Geneva: ILO Publications, International Labour Office, 1956-1973).

[4] R. F. Spragins, "A Statistical Model of International Trade", Unpublished Paper (Edmonton: University of Alberta, 1975).

[5] This is true only if exchange rates are flexible.

[6] R. A. Samuelson and A. Scott, Economics: An Introductory Analysis (Toronto: McGraw-Hill Co. of Canada Ltd., 1968), pp. 66-67.

[7] Ibid., p. 268.

[8] The equation,

$$GNP = C + I + G + (E-M)$$

where C = consumption
I = investment
G = government expenditures
E = exports
M = imports

illustrates that changes in either exports or imports are sufficient to raise or lower the level of GNP

[9] Alberta Bureau of Statistics, Alberta Statistical Review (Edmonton: Government of Alberta, 1973), p. 5.

[10] Samuelson and Scott, p. 268.

[11] Samuelson and Scott, p. 61.

[12] Samuelson and Scott, p. 61.

[13] Samuelson and Scott, p. 132.

[14] I. F. Pearce, International Trade (New York: W. W. Norton and Company, Inc., 1970), pp. 21-23.

[15] Ibid., p. 21.

[16] Ibid., p. 21.

[17] Ibid., p. 22.

[18] Informal discussions with Balfor-Guthrie of Vancouver, British Columbia.

[19] Kindleberger, p. 405.

[20] Samuelson and Scott, p. 363.

[21] Pearce, pp. 419-24.

[22] Ibid., pp. 420-24.

[23] W. W. Cooley and P. R. Lohnes, Multivariate Data Analysis (New York: John Wiley and Sons, Inc., 1971), p. 62.

[24] A. L. Comrey, A First Course in Factor Analysis (New York: Academic Press, 1973), p. 228.

[25] Spragins, see Appendix IV.

CHAPTER IV

DATA ANALYSIS

Before a discussion of statistical results is undertaken, some basic data limitations and manipulations shall be restated. Because of the magnitude of data in the models, scaling was required. This was accomplished by first scaling United States data which tended to be of greatest magnitude. Within the U.S. data matrix, variables were scaled to maintain the same relative mathematical relationship between variables. The data matrices of other countries were scaled in relation to the U.S. data.

The time element inherent in the raw data was removed by taking first differences of all data matrices.

For the regression analysis, a constant of 12 was added to each data point in the matrices so that natural logs could be calculated.

Covariance Matrices

The equivalencies of covariance matrices are determined by Bartlett's Test.[1] Because of computer program limitations, eleven groups could not be run simultaneously. In part, this problem was eliminated by combining countries and examining changes in probabilities for departures from normality.

Undifferenced Data

(1) Two groups with five countries in each group (excluding Canada). Thirty-six observations per group.

$H_o: \Sigma_1 = \Sigma_2$

Probability = 0.000112

Reject hypothesis.

(2) Five groups with two countries in each group (excluding Canada). Thirty-six observations per group.

$H_o: \Sigma_1 = \Sigma_2 = \Sigma_3 = \Sigma_4 = \Sigma_5$

Probability = 0.000372

Reject hypothesis.

Differenced Data

(1) Five groups with two countries in each group (excluding Canada). Thirty-five observations per group.

$H_o: \Sigma_1 = \Sigma_2 = \Sigma_3 = \Sigma_4 = \Sigma_5$

Probability = 0.000224

Reject hypothesis.

(2) Five groups with two countries in each group (excluding Canada). Thirty-four observations per group.

$H_o: \Sigma_1 = \Sigma_2 = \Sigma_3 = \Sigma_4 = \Sigma_5$

Probability = 0.000149

Reject hypothesis.

(3) Five groups with two countries in each group (including Canada and excluding Switzerland). Thirty-four observatoins per group.

H_o: $\Sigma_1 = \Sigma_2 = \Sigma_3 = \Sigma_4 = \Sigma_5$

Probability = 0.000149

Reject hypothesis.

Although it was not possible to compute Bartlett's Test for eleven groups, the analysis nonetheless, illustrates that the low probabilities for the different number of groups, different numbers of observations, and tests (including and excluding Canada) indicate that there are no serious departures from normality.

On the basis of the covariance analysis, the data from each country were combined in order to calculate the same factor loadings for all countries. However, it should be noted that the covariance analysis is probably the weakest research link.

Factor Analysis

Factor loadings were calculated using the computer program FACT01.[2]

The interpretation of factor results is a very difficult task, even at the best of times. In general, the factor solution is given by "those data variables with high loadings which are considered to be 'like' the factor in some sense and those with zero or near zero loadings are treated as being 'not like' the factor."[3] "Those variables that are 'like' the factor; that is, those with high loadings on the factor are examined to find out what they have in common that could be the basis for the factor that has emerged."[4]

The process of attempting to indentify the nature of a factor is facilitated by several conditions:

> (1) The higher the factor loading, the greater is the degree of overlapping of true variance between the data variable and the factor and the more the factor is like the data variable in question. The square of the correlation of the variable with the factor is a good indication of the extent of the overlap.
>
> (2) The more factor a pure variable is that defines a factor, the easier it is to make inferences regarding the nature of the factor. If a complex data variable has a substantial loading on a given factor, it is difficult to determine from this constituent information alone which of its many constituent parts is responsible.
>
> (3) The greater the number of variables with a substantial loading on the factor, other things being equal, the easier it is to isolate what the factor properly represents.5

The criteria for analyzing factor loading was an arbitrarily selected cut-off value of 0.55, where a factor loading below the cut-off was considered not to have a reliable correlation.

Factor loadings were rated according to a scale developed before the factor analysis was carried out. The scale is reproduced as follows:

Loading	Rating
0.00 - 0.54	n.a.
0.55 - 0.59	Poor
0.60 - 0.69	Fair
0.70 - 0.79	Good
0.80 - 0.89	Very Good
0.90 - 1.00	Excellent

The Varimax Orthogonal Rotation was used to interpret factor loadings.

Description of Export Factors

(Refer to Tables 1, 2, 3, 4, and 5 for Factor Loadings and Table 6 for Factor Description).

Factor 1: Income

Gross Domestic Product, Gross National Product and National Income are highly correlated because they represent primarily the same variable; namely, income.

Basically, the factor provides no new information that has not been previously ascertained by economists.

Factor 2: Ingenium ad Mercatura

Ingenium ad Mercatura literally means "ability to trade." This became apparent in the regression analysis which indicated that the greater the elasticity coefficient of the factor, depending on other variables in the equation, the higher the significance of the mathematical relationship

TABLE 1

EXPORT FACTOR

SCALE OF VARIABLE - FACTOR 1 - CORRELATIONS FOR DATA

Varimax Factor Loading		Percent of Variance	Rating
X_1	-0.023	0.00	n.a.
X_2	0.139	0.02	n.a.
X_3	-0.050	0.00	n.a.
X_4	0.965	0.93	Excellent
X_5	0.966	0.93	Excellent
X_6	0.924	0.85	Excellent
X_7	0.088	0.01	n.a.
X_8	-0.154	0.02	n.a.
X_9	0.090	0.01	n.a.
X_{10}	0.094	0.01	n.a.
X_{11}	0.171	0.03	n.a.
X_{12}	-0.295	0.09	n.a.
X_{13}	0.169	0.03	n.a.

TABLE 2

EXPORT FACTOR

SCALE OF VARIABLE - FACTOR 2 - CORRELATIONS FOR DATA

Varimax Factor Loading		Percent of Variance	Rating
X_1	-0.086	0.01	n.a.
X_2	-0.075	0.01	n.a.
X_3	0.409	0.17	n.a.
X_4	0.149	0.02	n.a.
X_5	0.158	0.02	n.a.
X_6	0.169	0.03	n.a.
X_7	0.692	0.48	Fair
X_8	-0.636	0.40	Fair
X_9	0.632	0.40	Fair
X_{10}	0.078	0.01	n.a.
X_{11}	-0.135	0.02	n.a.
X_{12}	0.085	0.01	n.a.
X_{13}	0.715	0.51	Good

TABLE 3

EXPORT FACTOR

SCALE OF VARIABLE - FACTOR 3 - CORRELATIONS FOR DATA

	Varimax Factor Loading	Percent of Variance	Rating
X_1	0.918	0.84	Excellent
X_2	0.882	0.78	Very Good
X_3	0.206	0.04	n.a.
X_4	0.064	0.00	n.a.
X_5	0.047	0.00	n.a.
X_6	0.025	0.00	n.a.
X_7	0.011	0.00	n.a.
X_8	0.076	0.01	n.a.
X_9	-0.059	0.00	n.a.
X_{10}	0.041	0.00	n.a.
X_{11}	-0.078	0.01	n.a.
X_{12}	0.161	0.03	n.a.
X_{13}	-0.077	0.01	n.a.

TABLE 4

EXPORT FACTOR

SCALE OF VARIABLE - FACTOR 4 - CORRELATIONS FOR DATA

	Varimax Factor Loading	Percent of Variance	Rating
X_1	0.041	0.00	n.a.
X_2	-0.077	0.01	n.a.
X_3	-0.560	0.31	Poor
X_4	0.057	0.00	n.a.
X_5	0.059	0.00	n.a.
X_6	0.034	0.00	n.a.
X_7	0.454	0.21	n.a.
X_8	0.138	0.02	n.a.
X_9	-0.238	0.06	n.a.
X_{10}	0.782	0.61	Good
X_{11}	-0.169	0.03	n.a.
X_{12}	0.392	0.15	n.a.
X_{13}	0.198	0.04	n.a.

TABLE 5

EXPORT FACTOR

SCALE OF VARIABLE - FACTOR 5 - CORRELATIONS FOR DATA

Varimax Factor Loading		Percent of Variance	Rating
X_1	0.090	0.01	n.a.
X_2	-0.029	0.01	n.a.
X_3	0.093	0.01	n.a.
X_4	0.010	0.00	n.a.
X_5	0.008	0.00	n.a.
X_6	-0.003	0.00	n.a.
X_7	0.046	0.00	n.a.
X_8	0.129	0.02	n.a.
X_9	-0.013	0.00	n.a.
X_{10}	0.026	0.00	n.a.
X_{11}	0.846	0.72	Very Good
X_{12}	0.613	0.38	Fair
X_{13}	0.005	0.00	n.a.

TABLE 6

EXPORT FACTOR DESCRIPTION

Factor 1: INCOME

Major Loadings in the Factor

Variable	Description	Loading
X_4	Gross Domestic Product	0.965
X_5	Gross National Product	0.966
X_6	National Income	0.924

Factor 2: INGENIUM AD MERCATURA

Major Loadings in the Factor

Variable	Description	Loading
X_7	Private Consumption	0.692
X_8	Exchange Rate	-0.636
X_9	International Reserves	0.632
X_{13}	Capital	0.715

TABLE 6 (Continued)

Factor 3: DOMESTIC TRADE POSITION

Major Loadings in the Factor

Variable	Description	Loading
X_1	Export Value	0.918
X_2	Balance of Trade #1	0.882

Factor 4: INTERNATIONAL TRADE POSITION

Major Loadings in the Factor

Variable	Description	Loading
X_3	Balance of Trade #2	-0.560
X_{10}	Bank Rate	0.782

Factor 5: POPULATION

Major Loadings in the Factor

Variable	Description	Loading
X_{11}	Population	0.846
X_{12}	Labor	0.613

as expressed by the level of R^2 (see Export and Import Regression Equations).

Each variable comprising the factor tends to indicate the country's ability to export or import automobiles. (Refer to defintion of terms in Chapter III.)

Factor 2 provides a new perspective on a country's ability to trade. Although an extensive literature research was undertaken, no mention of this combination of variables was found. At this juncture, Pearce's comments on the exchange rate appear to be verified by its association with other variables in the factor. However, complete verification will be determined by the regression analysis.

Factor 3: Domestic Trade Position

Export Value and Balance of Trade #1 are highly correlated most likely because they represent a country's domestic trade position. The variables combine in a common factor because the export value of automobiles is correlated, with a country's trade position in terms of it being a net exporter or a net importer. Evidence is provided by the positive factor loading for export value whereas the factor loading for import value has a negative factor loading.

Generally, the relationship expressed in Factor 3 may have potential value in determining and controlling a country's domestic trade position. However, a further analysis of this assumption will not be pursued as it is beyond the defined scope of this paper.

Factor 4: International Trade Position

Balance of Trade #2 and the Bank Rate are highly correlated because they most probably indicate a country's trade position vis à vis other countries in the world.

The variables in Factor 4 are indicative of the way in which the Bank Rate of a country may affect the position of a country's trade with respect to other countries. The relationship expressed in Factor 4 would tend to indicate that the Bank Rate, as a tool of instituting and controlling monetary policy of a national government, also could be used in controlling a country's trade flows among other nations. For example, a low bank rate might stimulate trade between countries while a high bank rate would tend to discourage trade.

Factor 5: Population

Factor 5 represents population because the variable tends to dominate the factor and because labor is simply a component part of total population.

Description of Import Factors

(Refer to Appendix V for Import Factor Loadings and Factor Descriptions).

For all intent and purpose, Import Factors are identical and therefore further elaboration and discussion is unnecessary.

Factor Scores

Factor scores were computed by the computer program FACT08.[6]

Review of the factor scores for each country indicated that no two countries were alike.

Regression Analysis

Regression equations were computed by the Bio-Medical Regression Program, BMD:02R.[7] which is a step-wise regression package.

Control information used in computations are as follows:

Number of Cases	
(a) no lag	17
(b) one-year lag	16
(c) two-year lag	15
Number of Original Variables	6
Dependent Variable	1
F-Level for Inclusion	0.999
F-Level for Deletion	0.999
Tolerance Level	0.001

Tests of significance on the means and beta coefficients were carried out at the 90 percent confidence interval where they were either accepted or rejected.

Test of Means

H_o: $\mu = 0$

Test of Betas

H_o: $\beta = 0$

Final regression equations were accepted on the basis of R^2 and the significance of beta coefficients. (Appendix VI shows regression results for all countries in Export and Import Models).

Discussion of Export Models: Summary Table

United Kingdom

In the unlagged United Kingdom model, Factors F3 (Domestic Trade Position) and F5 (Population) are the significant variables in the equation.

France

In the one-year lagged model for France, Factors F1 (Income), F2 (Ingenuim ad Mercatura) and F3 (Domestic Trade Position) are the significant variables in the equation.

Italy

In the unlagged export model for Italy, Factor F2 (Ingenuim ad Mercatura) is the only significant variable in the equation.

TABLE 7

EXPORT MODELS: SUMMARY

1. UNITED KINGDOM

$R^2 = 0.22$

$$(1-B)Y_t = (1.2795 + 2.0115F3_t - 1.5332F5_t)(1-B)$$

2. FRANCE

$R^2 = 0.43$

$$(1-B)Y_{t+1} = (8.3587 - 1.0286F1_t - 0.5950F2_t - 0.7431F3_t)(1-B)$$

3. ITALY

$R^2 = 0.18$

$$(1-B)Y_t = (2.5646 - 0.0293F2_t)(1-B)$$

4. SWEDEN

$R^2 = 0.32$

$$(1-B)Y_{t+1} = (3.1316 - 0.0696F1_t - 0.1238F2_t - 0.067F3_t)(1-B)$$

5. UNITED STATES

$R^2 = 0.38$

$$(1-B)Y_{t+1} = (2.9896 - 2.5689F2_t + 2.4296F3_t)(1-B)$$

6. CANADA

$R^2 = 0.33$

$$(1-B)Y_t = (-3.4371 + 2.5032F3_t)(1-B)$$

Sweden

In the one-year lagged Export Model for Sweden, Factors F1 (Income), F2 (Ingenium ad Mercatura) and F3 (Domestic Trade Position) are the significant variables.

United States

In the one-year lagged model for the United States Factors F2 (Ingenium ad Mercatura) and F3 (Domestic Trade Position) are the significant variables in the equation.

Canada

The significant variables in the unlagged export model for Canada is Factor F3 (Domestic Trade Position).

Responsiveness of Elasticity Coefficients. Because regression models have been computed using logged data, beta coefficients are measures of elasticity. Essentially, elasticity coefficients measure the responsiveness of a variable where the elasticity is defined as the percentage change in the dependent variable that results from a one-percent change in the independent variable. If the coefficient of elasticity is greater than one, the percent response becomes strogner as the coefficient increases in mangitude. If the elasticity coefficient is less than one, the percent response is proportionately less than if the coefficient was greater than one.[7]

For the United Kingdom, United States, and Canada, F3 (Domestic Trade Position) tend to be very elastic indicating that a country's domestic trade position is an important determinant in the quantity of automobiles exported by these nations.

General Comments. In all of the export models, R^2 tends to be very low. Although there appears to be no significant mathematical relationship between dependent and independent variables, the equations otherwise fit extremely well. This was indicated by the plot of residuals which illustrated no serious departures from homogeneity and by the low residual error term.

In the final export models, only France and Sweden had identical variables. All other models were not alike.

For the countries where there were no reportable results (Appendix VI), this is most probably due to the fact that either no mathematical relationship exists or that the dependent variable is too small for statistical measurement.

Export Models and Final Research Hypothesis

Strong Form Test

> Trade is caused by Supply (Exports) influenced by Indicators of Economic Activity.

For the countries having no reportable results, it will be assumed that no statistical relationship exists between the dependent and independent variables. Because of the lack of statisticsl evidence, the hypothesis cannot be supported.

The hypothsis is not supported for the export models of United Kingdom, France, Italy, Sweden, United States and Canada. The lack of empirical support for the hypothesis is due primarily to several reasons. First, R^2 is a measure of the "goodness of fit" of a regression line and, in addition, R^2 represents the stregnth of a mathematical relationship between dependent and independent variables. In all export models, R^2 tended to be very low, but not because the "goodness of fit" was inadequate. Generally, the fit of the regression line was excellent indicated by the low residual error term. It would appear, then, that R^2 was low because the models are missing variables which would increase the percentage variance in terms of its explanatory ability.

The second reason for the lack of statistical results is that Indicators of Economic Activity implies that all independent variables would be in the final model. The hypothesis could not be supported because all variables were not in the final equations.

Weak Form Test

When the corollary is considered in conjunction with the Final Hypothesis, export models for United Kingdom, France, Italy, Sweden, United States and Canada, the hypothesis is supported. The hypothesis is supported because the Weak Form Test allows individual variables to be accepted in support of the hypothesis rather than all variables which the

Strong Form Test Requires.

Thus, on a limited basis, there is a significant relationship between Exports and Indicators of Economic Activity, but only when the corollary is considered in association with the hypothesis.

Discussion of Import Models: Summary Table

United Kingdom

In the two-year lagged Import Model for the United Kingdom, the significant variables are F1 (Income) and F3 (International Trade Position).

Belgium-Luxembourg

In the unlagged Import Model for Belgium-Luxembourg the significant variables are F4 (Domestic Trade Postion) and F5 (Population).

Sweden

Significant variables in the two-year lagged model for Sweden are F1 (Income) and F2 (Ingenium ad Mercatura).

Switzerland

In the unlagged Import Model for Switzerland the significant variables are F1 (Income), F3 (International Trade Position) and F4 (International Trade Position).

TABLE 8

IMPORT MODELS: SUMMARY

---

1. UNITED KINGDOM

$R^2 = 0.33$

$$(1-B)Y_{t+2} = (2.3141 + 0.0305F1_t + 0.0383F3_t)(1-B)$$

2. BELGIUM-LUXEMBOURG

$R^2 = 0.66$

$$(1-B)Y_t = (2.6332 - 0.0737F4_t + 0.0139F5_t)(1-B)$$

3. SWEDEN

$R^2 = 0.28$

$$(1-B)Y_{t+2} = (2.6943 - 0.0359F1_t - 0.0485F2_t)(1-B)$$

4. SWITZERLAND

$R^2 = 0.66$

$$(1-B)Y_t = (2.4959 + 0.1123F1_t - 0.0391F3_6 - 0.0776F4_t)(1-B)$$

5. UNITED STATES

$R^2 = 0.35$

$$(1-B)Y_{t+1} = (29.4389 - 5.1052F1_t - 5.6388F2_t)(1-B)$$

6. CANADA

$R^2 = 0.45$

$$(1-B)Y_t = (8.7106 + 2.4878F1_t - 4.9554F4_t)(1-B)$$

United States

In the one-year lagged Import Model for United States, the significant variables are F1 (Income) and F2 (Ingenium ad Mercatura).

Canada

In the unlagged Import Model for Canada, the significant variables are F1 (Income) and F4 (Domestic Trade Position).

Responsiveness of Elasticity Coefficients. Generally, the responsiveness of elasticity coefficients in the Import Models are not significant by different from zero.

General Comments

The statistical results for Import Models are similar to those in the Export Models. Excluding Import Models for Belgium-Luxembourg and Switzerland, R^2 tended to be low, suggesting that mathematical relationship is weak. However, the residual error term and plots of residuals provided evidence to confirm that regression equations fit closely.

For those countries where there are no reportable results, the reasons are similar to those discussed for the Export Models. (see Appendix VI .)

- Import Models and Final Research Hypothesis

Strong Form Test

> Trade is caused by Demand (Imports) influenced by Indicators of Economic Activity.

The hypothesis is not supported for the Import Models which have no reportable results. The hypothesis is not supported for reasons similar to those mentioned in the discussion of Export Models and Final Hypothesis.

On the basis of the two reasons for the lack of statistical evidence discussed under Export Models and Final Hypothesis, the hypothesis cannot be supported for the Import Models of United Kingdom, Sweden, United States and Canada. However, the hypothesis is supported for the Import Models of Belgium-Luxembourg and Switzerland. The hypothesis is supported because the relatively high R^2 explains a significantly higher proportion of the variance when compared to the R^2's of other Import Models. In addition, to the high R^2, the closeness of fit for the equations is confirmed by the low residual error term.

Weak Form Test

For the Import Models of United Kingdom, Sweden, United States and Canada, the hypothesis in association with the corollary is supported for those reasons which were previously discussed under Export Models and Final Hypothesis.

Summary of Regression Results

Generally, for all models except the Import Models of Belgium-Luxembourg and Switzerland, statistical results are considered poor. There are several possible reasons for this occurrence.

It is highly probable that some important variables have not been considered in the model designs. For further research, it would be necessary to relax some of the assumptions established in Chapter III. This would permit variables such as taxes, tariffs, transportation costs, quotas and possibly a measure of the costs for operating automobiles in each country, to be considered in a statistical model design. However, the inclusion of additional variables would tend to raise the significance of R^2 primarily because more of the variacne could be explained. Accordingly, it would be necessary to adjust R^2 for the increased level of significance.

Despite the lack of significant statistical results, there are a number of exceptions to the above with important ramifications for the international marketer.

Upon a consideration of the Export and Import Models for Canada, a strong case may be made for the significance of the variable Domestic Trade Position in both models. This fact may be due wholly to the Auto-Pact agreement between the United States and Canada where trade occurs because of the political involvement of two governments. This is represented, in part, by the increasing quantity of automobiles exported and imported to and from the United States over the eighteen-year sample period. In addition, the trade data for Canada tends to be dominated by trade with the United States, where the trade flows account for over ninety-five percent of automobiles exported and imported by Canada, particularly in the latter half of the data series.

Thus, contrary to some popular economic theory, and providing existing factors of production and indicators of economic activity within a nation's economy, the occurrence of trade may be brought about through the political process. However, this may be true only of this particular type of product and may be the exception rather than the rule indicating that the choice of product was not adequate.

A second exception may be that of consumer preference. This is a topic of discussion which typically has been avoided by economic trade theorists because tastes are ignored. Yet, within the limited confines of the Export and Import Models, a strong case for the consumer preference argument can be made. The hypothesis appears to be more valid for the countries where there were no reportable results because of a non-existant mathematical relationship. Typically, these countries export and import a very small number of automobiles to and from Canada. The small quantity of automobiles traded among countries tend not to be a function of a large manufacturing base in a country but rather the fulfillment of a specialized demand. Evidence to this proposition may be found in the production of limited edition automobiles such as Canada's Brinkman, and Italy's Ferrari, to name only two.

Considering the economic conditions, which were prevalent during the period 1956 to 1973, of relative prosperity and stable economic conditions, one of the logical explanations for the occurrence of trade would be that of consumer preference.

Although consumer preference theory represents a radical departure from the basic assumptoins of this paper, the results of the statistical analysis indicate that further research in this area would not be without considerable merit.

The most significant statistical result of this paper was to show that no two countries were alike in terms of the final Export and Import Models. This fact has important ramifications for the international marketer and for the purposes of general model formulation.

For the marketer, the results indicate that marketing plans and strategies should be based on the economic forces that interact in the international marketing environment.

In terms of general model building, the results would tend to suggest that a more profitable exercise for marketers would be to develop models of trade for individual countries rather than attempting to design a model of trade capable of considering the many economic vagaries of different countries.

FOOTNOTES TO CHAPTER IV

[1] W. W. Cooley and P. R. Lohnes, Multivariate Data Analysis (New York: John Wiley and Sons, Inc., 1971), p. 62.

[2] Muir, Flathman, Precht and Hunka, Factor Analysis Package (Edmonton: The University of Alberta, 1969).

This program uses the Pearson Product-Moment Correlation Coefficient which is calculated by the following formula:

$$r = \frac{N \Sigma XY - \Sigma X \Sigma Y}{N \Sigma X^2 - (\Sigma X)^2 (N(Y^2 - (\Sigma Y)^2)}$$

[3] A. L. Comrey, A First Course in Factor Analysis (New York: Academic Press, 1973), p. 228.

[4] Ibid., p. 228.

[5] Ibid., Chapter 5.

[6] D. Flathman, Factor Scores (Edmonton: The University of Alberta, 1969). Also see H. H. Harman, Modern Factor Analysis (Chicago: The University of Chicago Press, 1960), pp. 337-348.

[7] W. J. Dixon, Biomedical Computer Programs (Los Angeles: University of California Press, 1971). Also see M. A. Zfroymsen, "Multiple Regression Analysis", in Mathematical Methods for Digital Computers, Part V, (17), Edited by A. Ralston and H. S. Wilf (Wiley, 1960).

CHAPTER V

CONCLUSIONS

Statistical results of the data analysis indicated that only the Import Models of Belgium-Luxembourg and Switzerland could support the Strong Form Test of the null hypothesis. However, the Weak Form Test suggested that the Export Models of United Kingdom, France, Italy, Sweden, United States and Canada and the Import Models of United Kingdom, Sweden, United States and Canada were viable models supporting the null hypotheses by way of their statistical rejection.

Although the relationships between export and import quantities and indicators of Economic Activity was generally weak, the mathematical fits of equations are excellent.

The statistical results for regression equations ranged in significance from no results to marginally significant for the models of trade. The results have some important ramifications for the marketing practitioner. The poor results intimate that there may be other reasons for the occurrence of international trade. Some of these reasons include the political involvement of governments in negotiating trade agreements and the distinct possibility of consumer preference. However, these reasons are presented here more as propositions, particularly consumer preference, and would undoubtedly require further research and empirical analysis.

The regression results provided evidence that the developed trade models are similar structurally; yet mutually exclusive in variable content. This is an important finding for international marketers because it shows that each country is different in relation to international trade and therefore marketers must be cognizant of what these differences are and plan accordingly.

The effectiveness and reliability of research and analysis within the paper are limited by the short time period studied, the covariance analysis and the limitations in definitions of terms such as the surrogate measure for capital.

The value of the research may be judged, in part, by whether or not the stated objectives of the paper have been achieved. In terms of the primary objective, the thesis was successful within a limited context of providing useful insights for the marketer who is concerned with international trade. The secondary objectives of the paper were fulfilled, however, not to the extent that was anticipated when the project was first undertaken.

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APPENDIX I

UNITED KINGDOM

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	21389	116	24041	19383	23847	148000	206600	208900	168400
1957	29686	185	32583	37573	32208	-81000	218600	221100	178400
1958	49039	203	56149	41793	55731	90000	227700	230600	186000
1959	76142	349	88373	77963	87593	-325000	239800	242400	195500
1960	96060	535	108555	122563	107329	-1142000	254900	257200	208600
1961	45758	276	60944	65066	60293	-426000	272200	274700	223300
1962	37089	208	53088	48732	52600	-286000	285300	288600	233500
1963	15046	693	22044	152606	20518	-224000	302800	306800	248300
1964	33884	849	45579	190974	43669	-1453000	329300	333200	268800
1965	32492	524	45329	119715	44132	-664000	353900	358300	287100
1966	30132	364	41955	87707	41078	-204000	377900	381800	301700
1967	24476	102	37701	23648	37464	-1446000	398200	402000	318200
1968	44121	128	58648	31048	58338	-1555000	428200	431600	335900
1969	49787	678	75365	156163	73903	-343000	458200	463200	353500
1970	22300	20	36513	4283	36470	29000	501800	506700	386900
1971	29574	21	49697	6400	49633	718000	555200	559900	515900
1972	27077	4	53263	3400	53229	1675000	616300	630500	566400
1973	14601	2	31633	800	31625	-5876000	702700	717400	621800

UNITED KINGDOM CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
138300	27633	2276000	55000	51410	23190	369910
145800	28157	2274000	70000	51630	23240	382400
153000	27019	3068000	40000	51840	23090	398220
161200	26678	2800000	40000	52130	23310	417610
169300	27926	3719000	50000	52350	23750	425930
178400	29288	3318000	60000	52820	24010	438770
189200	30205	3308000	45000	53340	24190	495040
201300	30232	3148000	40000	53640	24290	573600
215200	29967	2315000	70000	54010	24540	605860
229400	30127	3004000	60000	54370	24820	673800
242500	30238	3099000	70000	54660	24970	667590
254200	26016	2695000	80000	54990	24440	745670
272500	25579	2422000	70000	55300	24330	788750
288500	25761	2527000	80000	55550	24840	783530
312200	24185	2827000	70000	55730	24710	886490
345000	25581	6582000	50000	55570	24330	1015730
392600	23378	5647000	90000	55800	24010	1397340
447300	23134	6476000	130000	55930	24550	1758630

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

BELGIUM LUXEMBOURG

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	1	388	9460	568032	-585086	90000	483000	490000	399000
1957	1	506	17950	768537	-766742	-46000	511000	519000	421000
1958	5	314	66920	532446	-525754	90000	515000	523000	424000
1959	4	329	44730	594317	-589844	-48000	532000	538000	431000
1960	11	360	133780	584872	-571494	14000	564000	572000	458000
1961	12	256	154200	427937	-412517	-40000	600000	606000	481000
1962	12	250	173100	438372	-421062	125000	643000	648000	515000
1963	13	342	192500	585687	-566437	-80000	691000	696000	551000
1964	13	1333	218120	2118580	-2096768	22000	773000	778000	618000
1965	18	3042	261530	5713504	-5687351	86000	842000	849000	677000
1966	25	2137	413260	4034167	-3992841	-114000	907000	904000	721000
1967	23	203	439130	414838	-370925	122000	971000	978000	768000
1968	23	1625	401960	3345215	-3305019	-40000	1031000	1039000	819000
1969	33	775	660130	1653272	-1587259	176000	1144000	1152000	911000
1970	24	88	465010	201065	-154564	788000	1274000	1285000	1018000
1971	29	407	580000	1027000	-969000	850000	1405000	1417000	1129000
1972	18	206	420000	539000	-497000	1035000	1566000	1583000	1430000
1973	12	226	390000	610000	-571000	1180000	1745000	1768400	1811000

BELGIUM LUXEMBOURG CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
334000	48196	1219000	35000	89200	33890	981900
359000	49255	1148000	45000	89900	34240	1003700
357000	48051	1553000	35000	90500	33920	1069000
374000	47583	1306000	40000	91000	33640	1130100
391000	49501	1506000	50000	91500	33850	1210000
408000	51921	1813000	45000	91800	34300	1360600
429000	53621	1753000	35000	92200	34910	1442800
465000	53861	1970000	42500	92900	35250	1623200
497000	53308	2222000	47500	93800	35660	1767100
541000	53363	2334000	47500	94600	35980	1933000
583000	54244	2350000	52500	95300	36340	2116000
613000	53645	2590000	40000	95800	36160	2318700
662000	53790	2187000	45000	96200	36140	2545800
720000	53301	2388000	75000	96500	36820	2867400
769000	50192	2847000	65000	96800	37460	3210300
850000	44859	3473000	55000	97300	37860	3630100
947000	43866	3870000	50000	97100	37810	4297000
999000	41147	5100000	77500	97600	38160	6586200

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

P

DENMARK

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	1	25	6000	33781	-33181	-83000	309300	308800	251000
1957	1	170	7950	261421	-260626	-67000	328700	328200	266500
1958	2	98	23070	158935	-156628	18000	343400	343300	277100
1959	3	79	23300	137061	-134731	-109000	386800	381100	307100
1960	6	76	51060	124013	-118907	-211000	411000	411300	330900
1961	6	29	63330	47617	-41284	-241000	456200	455800	369300
1962	6	1	77000	2270	5430	-363000	513900	513700	413000
1963	5	112	89580	167498	-158540	-111000	547100	546500	432100
1964	5	223	102660	332726	-322460	-379000	625300	624600	495300
1965	4	245	63230	442529	-436206	-368000	702500	701600	553300
1966	3	47	31620	96765	-93603	-403000	768400	767200	597700
1967	6	173	38210	393550	-389729	-458000	844900	843300	655300
1968	3	13	106440	32477	-21833	-454000	922700	920600	707900
1969	5	76	81970	167956	-159759	-630000	1049400	1046400	802500
1970	6	11	173980	28568	-11170	-760000	1159200	1156300	878500
1971	5	49	100000	130000	-120000	-668000	1278800	1273400	1170000
1972	5	1	160000	3000	13000	-430000	1446700	1440600	1321900
1973	1	9	20000	26000	-24000	-1131000	1660500	1653700	1516000

DENMARK CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
214600	66354	138000	55000	44700	21300	632300
220100	68082	172000	55000	44900	21350	669900
231500	66581	230000	45000	45100	21400	753300
250200	65819	329000	50000	45500	21650	818500
269300	68784	286000	55000	45800	22000	857800
299400	71821	282000	65000	46100	22250	930800
336500	74389	256000	65000	46500	22490	1021800
355400	74701	470000	55000	46800	22640	1139400
398700	74338	645000	65000	47200	22820	1271300
437500	74078	587000	65000	47600	22850	1402800
485800	74956	597000	65000	48000	23040	1597800
535100	80657	534000	75000	48400	23230	1726400
577900	80471	449000	60000	48600	23330	1996500
652200	80397	446000	90000	48900	23470	2217900
719200	75661	484000	90000	49300	23660	2238300
753700	70775	721000	75000	49600	23810	2400600
818800	68169	855000	70000	49900	23950	2804200
928900	62676	1324000	90000	50300	24140	3170900

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

FRANCE

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	33	9	2826	19501	8763	-2000000	191000	191300	148400
1957	188	15	16095	35439	125509	2000000	212700	213000	164100
1958	7360	18	681130	44412	6766891	-2950000	244700	244700	188600
1959	16549	19	1662102	42824	16578195	4350000	272600	272600	202900
1960	9783	14	958480	31512	9553290	920000	301400	301600	231000
1961	7476	15	741165	39152	7372500	4170000	328200	328400	251000
1962	4955	4	494742	8543	4938875	5010000	366700	367200	280100
1963	3104	8	340547	17207	3388259	1770000	411400	412000	312100
1964	4566	416	537459	784454	4590135	-890000	456000	456700	343500
1965	8099	244	952845	467395	9061052	3880000	489000	489800	367900
1966	6850	160	814110	342818	7798281	-380000	531700	532600	399100
1967	8913	96	1046481	219850	10244963	2800000	573800	574800	433300
1968	12494	66	1419486	150270	14044586	380000	629300	630000	482800
1969	15331	15	1815087	34235	18116635	-8790000	733300	734000	561900
1970	13704	13	1722643	32629	17193796	3200000	819200	820200	630900
1971	18021	17	2270700	52000	22655000	11060000	903700	904200	693800
1972	6259	8	1635300	33000	16320000	12750000	898900	1001900	804300
1973	3688	4	840900	15000	8394000	12020000	1001900	1143800	895000

FRANCE CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
128000	33590	131100	30000	438400	17540	381350
141700	41348	64500	50000	443100	17720	477070
161000	47299	105000	45000	447900	17920	507730
170200	46773	173600	40000	452400	18100	591770
184900	48834	227200	35000	456800	18710	660450
202200	51107	333500	35000	461600	18720	757240
226300	52812	404900	35000	470000	18820	888960
254600	52986	490800	40000	478200	19130	1012170
277900	52631	572400	40000	483100	19440	1122740
297500	52697	634300	35000	487600	19560	1244040
321400	53670	673300	35000	491600	19720	1318150
348100	53051	699400	35000	495500	19780	1495460
381200	53082	420100	60000	499100	19740	1756720
433900	59643	383300	80000	503200	20470	1929230
476700	55769	496000	20000	507700	20590	2232320
532700	52355	825300	65000	512500	20510	2630680
598000	51025	1001500	75000	517000	20660	3253940
679000	46882	852900	110000	521300	20960	3711270

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

WEST GERMANY

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	18288	5	153762	9935	153662	697000	1990000	1988000	1444000
1957	26065	8	207184	16883	207015	980000	2164000	2163000	1682000
1958	31874	7	278399	16041	278238	1162000	2312000	2315000	1801000
1959	39052	27	344760	67496	344085	1215000	2504000	2506000	1936000
1960	39612	24	350888	63449	350253	1264000	3026000	3024000	2358000
1961	34815	9	348075	18893	347886	1623000	3335000	3327000	2580000
1962	32256	12	351714	28131	351433	767000	3609000	3601000	2775000
1963	30403	8	333764	19128	333573	1413000	3848000	3840000	2958000
1964	34721	9	381136	24014	380896	1351000	4221000	4209000	3242000
1965	39137	7	440730	17343	440556	248000	4620000	4604000	3552000
1966	27878	6	332959	20865	332750	1878000	4921000	4908000	3772000
1967	28822	26	357382	49200	356890	4166000	4961000	4947000	3752000
1968	41398	116	541601	270885	538892	4485000	5405000	5389000	4157000
1969	38908	44	567331	109363	566238	3902000	6039000	6026000	4584000
1970	35733	4	601338	9324	601045	4024000	6842000	6829000	5264000
1971	47499	17	915570	40000	915170	4315000	7569000	7561000	5799000
1972	35710	5	860010	21000	859800	6065000	8346000	8346000	7411000
1973	44490	3	1185360	15000	1185210	11752000	9306000	9303000	8271000

WEST GERMANY CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
117700	40298	420200	50000	530000	22260	393280
128200	41377	519700	40000	576500	24210	456790
137700	40280	587900	30000	542800	24350	511920
146500	39732	479100	40000	548800	24560	582320
172400	41543	703300	40000	554200	25950	661880
189000	41678	716500	30000	562300	26250	727920
205200	43090	695700	30000	569500	26380	817940
218200	42966	765100	30000	576100	26460	910540
235000	42717	788200	30000	582900	26520	1071410
258700	43065	743000	40000	590400	26700	1194900
277900	43103	802900	50000	596800	26600	1298680
284200	43225	815300	30000	598700	25800	1404920
301800	42912	994800	30000	601700	25870	1606110
334000	39597	712900	60000	608500	26340	1778930
370300	36856	1361000	60000	615600	26710	2023060
410200	32752	1839200	40000	612900	26670	2273960
450900	31879	2378500	45000	616700	25930	2615370
496800	26916	3314700	70000	619700	25990	2871250

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

ITALY

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	44	27	150	57718	-42749	-732000	1636000	1639400	1314400
1957	8	17	151	40706	-25586	-769000	1756500	1762200	1410800
1958	1726	38	13553	78593	1276666	-373000	1886200	1892300	1523300
1959	2328	22	19350	57961	1876994	-133000	2002900	2011300	1619200
1960	1130	1	10302	2210	1027994	-634000	2175100	2182800	1750700
1961	248	5	2613	10001	251331	-577000	2419800	2428900	1944700
1962	482	4	5239	7000	51871	-910000	2719500	2730300	2195800
1963	318	2	3491	3998	345085	-1901000	3114000	3126100	2521600
1964	372	4	4919	7233	484646	-645000	3402700	3417900	2759100
1965	1133	23	13524	44726	1307660	646000	3661000	3681800	2966500
1966	1894	26	23009	56582	2244286	334000	3955800	3982900	3223500
1967	1856	21	24253	47420	2377928	-21000	4355500	4380400	3537300
1968	3119	25	52086	55955	5152681	1048000	4697900	4728000	3840000
1969	6032	16	99487	41829	9906913	542000	5170000	5209000	4232100
1970	4869	14	84763	30890	8445380	-381000	5790300	5821200	4711400
1971	5548	5	92160	13000	9203000	328000	6259600	6291300	5123900
1972	6595	12	111850	37000	11148000	1000	6850100	6888000	6292700
1973	7564	5	154590	18000	15441000	-3962000	8031200	8057400	7338000

ITALY CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
110800	59978	1263000	40000	484700	19870	253690
117260	61533	1479000	40000	484700	19710	382800
124610	60160	2278000	35000	490400	20310	434050
129940	59131	3120000	35000	493600	20170	499630
139800	61812	3251000	35000	496400	20140	582650
152860	64729	3800000	35000	499000	20170	669100
171970	66888	4068000	35000	502400	19950	795460
200900	67273	3619000	35000	506400	19630	911670
217570	67110	3824000	35000	511200	19580	1018670
232630	67155	4800000	35000	515800	19200	1144180
255610	67678	4911000	35000	519700	18880	1309680
282140	67433	5463000	35000	523500	19110	1490280
300660	66889	5341000	55000	527500	19070	1687550
328360	67122	5045000	37500	531700	18870	1905500
372800	62942	5352000	55000	536700	18960	2160830
402400	59531	6787000	45000	540800	18890	3219140
439140	57994	6079000	40000	543500	18330	3053540
517840	60537	6434000	65000	548900	18500	3863600

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

NETHERLANDS

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	24	6	57510	8867	486643	-4960000	322800	325700	264900
1957	4	2	4806	3567	1239	-4610000	351400	353600	290400
1958	4	1	2900	1619	1281	320000	354400	359300	295600
1959	11	1	9558	2052	7506	190000	378300	384400	314400
1960	109	5	106103	10817	95286	-1160000	423500	427300	351500
1961	85	5	84751	12609	72142	-3470000	446900	452900	370500
1962	61	7	63399	16075	47324	-2790000	481300	485200	395900
1963	37	6	42046	13288	28758	-4430000	522300	528600	431300
1964	13	9	20694	19225	1469	-7470000	614600	621500	510800
1965	18	17	22975	37398	-14423	-5590000	687100	693700	569500
1966	18	335	27221	740555	-713334	-6800000	749400	754000	615700
1967	12	237	21365	589438	-568073	-5580000	823000	830000	677600
1968	17	169	33949	383493	-349544	-3290000	897200	903400	732500
1969	32	361	60546	775607	-715061	-4090000	1016100	1022600	840700
1970	26	113	49878	267143	-217265	-8500000	1135100	1139200	926900
1971	19	262	38000	673000	-635000	-7000000	1277700	1279700	1032700
1972	25	140	61000	412000	-351000	3920000	1470800	1474800	1351700
1973	18	182	46000	527000	-481000	7090000	1656900	1667900	1532900

NETHERLANDS CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
196200	36757	1141000	37500	108900	40300	663300
207300	37330	1056000	50000	110200	40800	689200
211300	36395	1561000	30000	111900	41400	758300
223400	35921	1442000	35000	113500	42000	863300
242700	37549	1861000	35000	114800	42500	996100
261500	37548	1955000	35000	116400	43100	1057800
284900	38801	1943000	40000	118000	43200	1151900
316600	38912	2102000	35000	119700	44000	1256100
358200	38582	2349000	45000	121200	44800	1375000
400800	38818	2416000	45000	122900	45500	1528600
436700	39169	2448000	50000	124500	46100	1659900
475200	38869	2619000	50000	126000	46600	1879100
509900	38685	2463000	50000	127200	47100	2142800
583400	38890	2529000	60000	128700	47600	2408600
652606	36340	3234000	60000	130300	48200	2692700
724600	32611	3796000	50000	131900	48800	3009900
820200	32118	4785000	40000	133300	49300	3911100
915100	28121	6547000	80000	134400	49700	4774200

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

SWEDEN

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	2	123	244	17783	-17539	-268000	513500	514800	472700
1957	27	21	3607	3556	51	-298000	553100	554600	509900
1958	450	18	56914	3214	53700	-280000	581000	582500	534500
1959	1314	20	168847	3662	165185	-196000	618800	620200	567100
1960	1543	29	204892	5358	199533	-332000	675000	676000	545000
1961	1597	42	266823	7946	258877	-178000	736000	737000	595000
1962	1657	59	291759	10013	281746	-190000	803000	804000	642000
1963	3060	70	481596	13212	468384	-102000	871000	872000	695000
1964	2753	1393	362838	258852	103985	-148000	974000	976000	783000
1965	3612	2013	465153	376411	88741	-365000	1078000	1080000	863000
1966	4655	560	675016	108061	566954	-283000	1173000	1174000	931000
1967	5599	158	937286	35202	902084	-144000	1264000	1264000	1002000
1968	7744	133	1334954	30700	1304253	-171000	1396000	1396000	1058000
1969	7331	193	1311698	42705	1268993	-172000	1516100	1514600	1207400
1970	8761	55	1573132	12875	1560258	-194000	1692000	1689800	1355100
1971	9236	139	1808400	38000	1770400	380000	1820900	1817700	1410200
1972	6789	13	1676500	3900	1672600	639000	1991800	1988400	1803500
1973	1176	1	532800	400	532399	1420000	2178400	2175100	1957600

SWEDEN CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
31680	49712	535000	40000	732000	35100	1314600
33330	50939	501000	50000	737000	35400	1432500
35610	49873	516000	45000	742000	35600	1545800
37240	49365	478000	45000	745000	35800	1721700
39300	51593	528000	50000	748000	35900	1916300
42600	54096	735000	50000	752000	36100	2028300
46100	55916	802000	40000	756000	36800	2227800
50000	56207	758000	40000	760000	37300	2430900
54400	55295	965000	50000	766000	37000	2683200
59900	55685	972000	55000	773000	37300	2918100
64700	56141	1027000	60000	781000	37700	3248500
69300	55828	841000	60000	787000	37300	2888900
79300	55571	810000	50000	791000	37800	3250600
85270	55479	696000	70000	797000	38200	3504100
92400	52233	761000	70000	804000	38500	3732700
98470	48757	1110000	50000	811000	38600	3501500
107050	47271	1575000	50000	812000	38600	3865800
114950	45707	2528000	50000	814000	38800	4491200

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

SWITZERLAND

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	1	72	11330	113595	-112462	-303000	289000	293000	250000
1957	1	94	26940	164239	-161545	-386000	305000	309000	264000
1958	6	78	64030	133049	-126646	-135000	312000	315000	272000
1959	6	6	93010	13219	-3918	-208000	334000	338000	290000
1960	1	19	15500	41487	-39937	-317000	366000	371000	313000
1961	2	2	39320	4352	-420	-618000	410000	415000	349000
1962	4	5	61340	10478	-4344	-753000	455000	460000	388000
1963	6	4	83360	8995	-659	-777000	498000	504000	423000
1964	8	408	105380	621523	-610985	-901000	549000	555000	466000
1965	8	1361	112530	2514922	-2503669	-650000	591000	600000	501000
1966	6	656	86910	1256663	-1247972	-569000	635000	646000	540000
1967	8	246	80350	561184	-553149	-525000	677000	688000	575000
1968	5	312	77820	708620	-700838	-384000	727000	742000	619000
1969	7	307	128120	672516	-659704	-512000	792000	809000	670000
1970	5	105	125960	285385	-272789	-1181000	865000	889000	743000
1971	4	277	60000	784000	-778000	-1366000	984000	1008000	802000
1972	2	232	30000	690000	-687000	-1479000	1134000	1161000	866000
1973	2	125	60000	414000	-408000	-1500000	1282000	1294000	936000

SWITZERLAND CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
190000	41123	1882000	15000	504000	23700	14638
200000	42194	1898000	25000	513000	24100	14663
207000	41533	2063000	25000	520000	24400	15797
217000	41190	2063000	20000	526000	24700	16853
230000	42878	2324000	20000	536000	25120	19026
251000	45016	2759000	20000	550000	25900	21812
279000	46550	2919000	20000	566000	26600	24091
302000	46641	3122000	20000	577000	27100	26804
328000	46347	3321000	25000	587000	27600	28886
353000	46419	3444000	25000	595000	28000	31037
379000	46896	3545000	35000	600000	28200	3327
406000	46749	3696000	30000	607000	28500	36049
431000	46152	4293000	30000	615000	28900	40876
465000	46336	4425000	37500	622000	29200	47141
512000	43605	5132000	37500	625000	29400	52859
654000	39236	6966000	37500	631000	29700	56885
743000	37574	7488000	37500	639000	30000	57405
739000	32304	8078000	45000	644000	30300	62069

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

UNITED STATES

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	50587	30	130524	70	130454	4575000	417100	419200	350800
1957	24620	108	78337	201	78136	6099000	438900	441100	366100
1958	23356	56	69473	130	69343	3312000	445100	447300	367800
1959	31098	112	82365	243	82122	985000	481500	483700	400000
1960	33236	187	84187	463	83725	4757000	501300	503700	414500
1961	16574	175	47953	400	47553	5422000	517100	520100	427300
1962	17878	150	54314	322	53992	4561000	556900	560300	457700
1963	7372	319	28636	639	27997	5241000	587100	590500	481900
1964	15138	10950	44294	20822	23471	6831000	628500	632400	518100
1965	46408	31692	125432	66216	59216	4942000	680700	684900	564300
1966	114748	146794	315480	346378	-30898	3927000	745800	749900	620600
1967	238628	310974	657211	820469	-163258	3859000	789400	793900	653600
1968	308359	472417	896700	1281942	-385242	624000	858800	865000	711100
1969	291359	676137	790526	1760312	-969786	660000	923100	929100	763700
1970	252378	696730	660291	1664222	-1003931	2110000	970200	976400	798600
1971	355130	794909	959829	2004852	-1045023	-2844000	1042400	1050400	855700
1972	383943	843192	1055972	2122111	-1066139	-6987000	1153500	1158000	1055100
1973	474791	874226	1437761	2316396	-878635	434000	1289600	1294900	1184100

UNITED STATES CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
266700	10403	2366600	30000	168900	64979	813840
281400	10153	2483200	30000	171980	65011	828900
290100	10359	2254000	25000	174880	63966	886300
311200	10472	2150500	40000	177830	65581	910200
325200	10040	1935900	30000	180680	66681	947000
335200	9570	1875300	30000	183760	66796	1003900
355100	9222	1722000	30000	186540	67846	1007260
375000	9191	1684300	35000	189240	68809	1149700
401200	9259	1667200	40000	191890	70357	1253570
432800	9225	1545000	45000	194300	72179	1336920
466300	9162	1488200	45000	196566	72895	1404700
492100	9191	1483000	45000	198710	74372	1541000
535800	9272	1571000	55000	200710	75920	1694800
579600	9269	1696400	60000	202680	77902	1775900
616800	9897	1448700	55000	204880	78627	1890500
664900	9978	1319000	45000	207050	79120	2089800
729000	10044	1315000	45000	208840	81702	2696200
805200	10042	1438000	75000	210400	84409	3016500

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

CANADA

YEAR	EXPT QUAT (1)	IMPT QUAT (2)	EXPT VALU (3)	IMPT VALU (4)	B OF T #1 (5)	B OF T #2 (6)	GDP (7)	GNP (8)	NATL INCM (9)
1956	801	90370	1253	156208	-162004	-140000	309700	320600	243800
1957	1126	80601	1903	131861	-129957	-620000	323400	335100	253600
1958	831	113822	1545	162216	-160670	-184000	333400	347800	264400
1959	964	166507	1974	225484	-223510	-440000	354000	368500	277800
1960	1250	181491	2600	240621	-238020	-153000	367700	383600	288400
1961	814	106573	1691	154155	-152431	171000	380300	396500	297800
1962	700	94400	1420	151056	-149595	172000	411700	429300	323700
1963	1564	59364	31127	92706	-89748	465000	461000	459800	347000
1964	15594	91473	29229	137544	-108316	648000	504600	502800	376800
1965	39168	130929	80415	230433	-150018	109000	556600	553600	412200
1966	151085	186209	354884	408003	-53119	207000	622400	618300	462900
1967	312236	308343	823333	752990	70343	524000	669900	664100	497400
1968	475004	417283	1287506	1042354	245153	1273000	733000	725900	546100
1969	678602	408825	1765755	963988	801767	797000	804000	797500	604700
1970	679153	337806	1665249	798478	866770	2891000	861500	854500	641900
1971	796103	465065	2008015	1151202	856813	2175000	938400	930900	705800
1972	843813	468423	2123919	1239661	884258	1635000	1049100	1034900	918600
1973	874783	546343	2318032	1617219	701411	2134000	1205600	1189000	1058400

CANADA CONTINUED

PRIV CONS (10)	EXCH RATE (11)	INTL RESV (12)	BANK RATE (13)	POP (14)	LABOR (15)	CAPITAL (16)
200900	9597	204300	39200	161200	55850	422300
214900	9847	193600	38700	166800	57310	451400
228500	9641	204600	37400	171200	57060	509460
243900	9528	203700	53700	175200	58700	485650
254800	9960	199800	35000	179100	59650	543370
259300	10430	229200	32400	182700	60550	606340
274500	10778	256100	40000	186100	62250	631350
292600	10809	261300	40000	189600	63750	680030
313900	10741	289000	42500	193300	66090	730780
339500	10750	303700	47500	196800	68620	795540
368900	10838	270200	52500	200500	71520	853670
399700	10809	271700	60000	204400	73790	970620
437000	10728	304600	65000	207700	75370	1095470
474900	10731	310600	80000	210900	77800	1203640
500400	10103	467900	60000	213200	78790	1332340
539600	10022	570100	47500	216000	80790	1529100
603400	9956	605000	47500	218500	83290	1537110
690900	9958	576800	72500	221300	87590	1773300

SOURCES OF ORIGINAL DATA
VARIABLES 1 TO 4 : STATISTICS CANADA TRADE DATA
VARIABLES 5 AND 16 : RFS
VARIABLES 6 TO 14 : INTERNATIONAL MONETARY FUND
VARIABLE 15 : INTERNATIONAL LABOR CONGRESS

APPENDIX II

1. Method of Interpolation

In each instance where a missing data observation was located at the end or beginning of a series, it was estimated using interpolation. The series was first graphed and the line then extended according to the trend of the series. The missing observation was found by reading the co-ordinates from the axes of the graph. See Figure I-1.

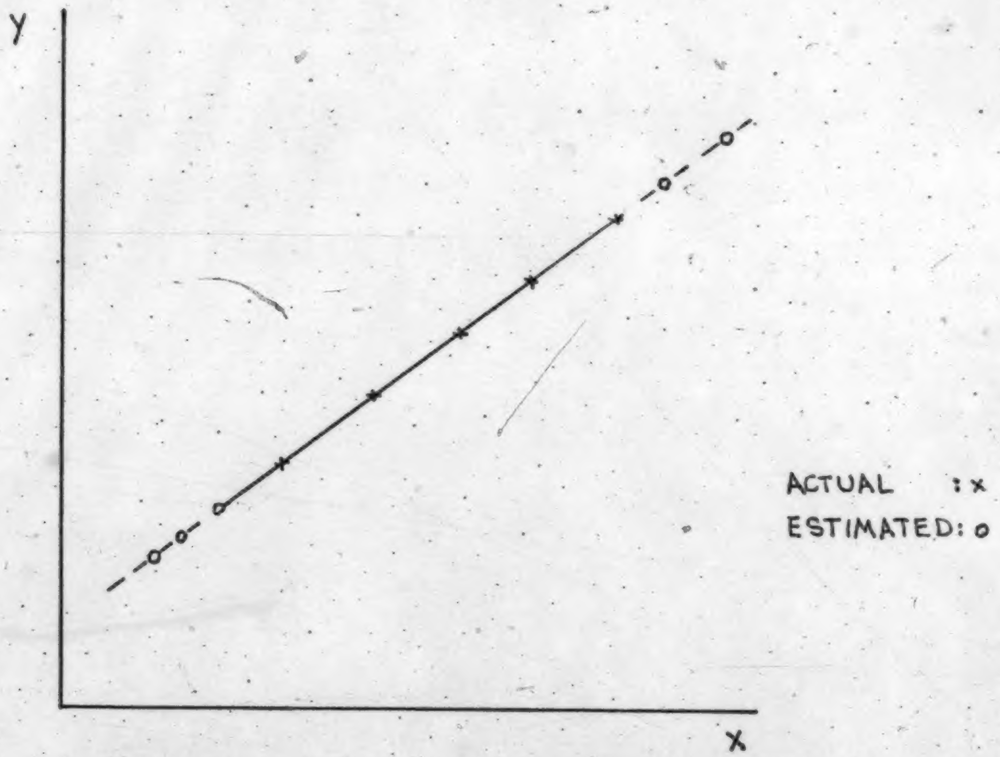

Figure II-1

2. Method of Extrapolation

Extrapolation was used in order to estimate missing observations within the data series. Missing observations were found by subtracting the tth observation from the t+N observation. This figure was divided by the number of missing data observations to find the average value. This figure then became the first missing observation. Successive observations were calculated by adding the average value to the preceeding data point. See Figure I-2.

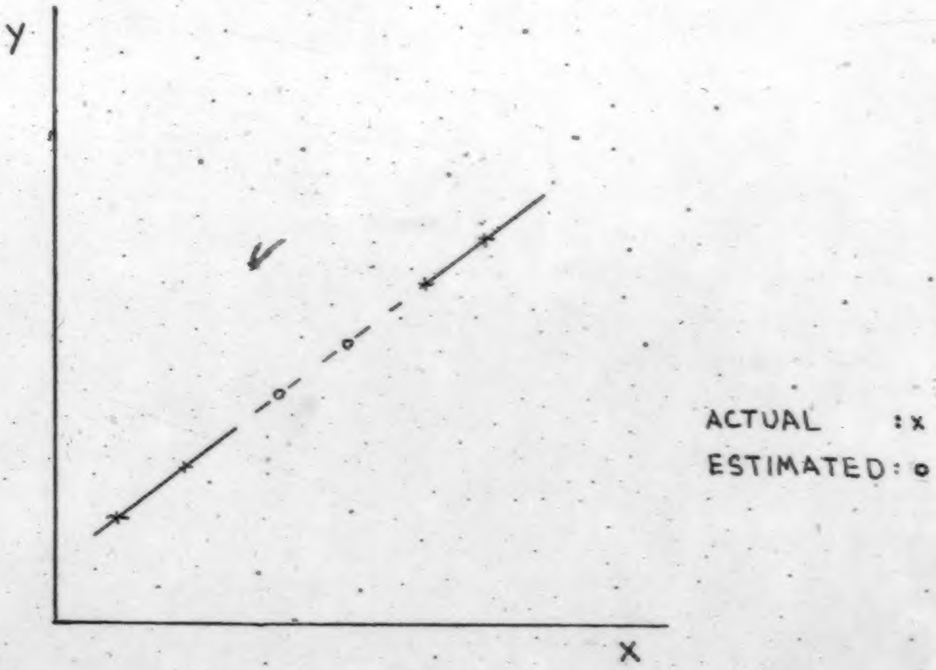

Figure II-2

3. Method of Estimating Labor

Missing labor observations were estimated by assuming that labor was a constant percentage of the total population over time.

4. Estimated Observations by Country, Variable and Year

(a) BELGIUM-LUXEMBOURG

Year	Import Value	Import Quantity	Balance of Trade #1	Balance of Trade #2
1961	$15,420	12	-$412,517	
1962	17,310	12	-$421,062	-$60,000,00
1963	19,250	13	-$566,437	

(b) DENMARK

Year	Export Value	Export Quantity
1963	$167,498	112

Year	Import Value	Import Quantity	Balance of Trade #1
1956	$600	1	-$33,181
1961	$6333	6	-$41,284
1962	$7700	6	5,430
1963	$8958	5	-$158,540

Year	Labor ('000)
1965	2285
1966	2304
1967	2323
1968	2333
1969	2347
1970	2366
1971	2381
1972	2395
1973	2414

(c) FRANCE

Year	Labor ('000)
1956	17,540
1957	17,720
1958	17,920
1959	18,100

(d) GERMANY

Year	Labor ('000)
1956	22,260

(e) ITALY

Year	Export Value	Export Quantity	Balance of Trade #1	Labor ('000)
1956				19,870
1962	$7,000	4	$516,871	

(f) NETHERLANDS

Year	Import Value	Import Quantity	Balance of Trade #1
1961	$84,751	85	$72,142
1962	63,399	61	47,324
1963	42,046	37	28,758

Year	Labor ('000)
1956	4,030
1957	4,080
1958	4,140
1959	4,200
1960	4,250
1961	4,310
1965	4,550
1966	4,610
1967	4,660
1968	4,710
1969	4,760
1970	4,820
1971	4,880
1972	4,930
1973	4,970

(g) SWEDEN

Year	Export Value	Export Quantity	Balance of Trade #1
1973	$4,003	1	-$175,392

Year	Import Value	Import Quantity	Balance of Trade #1
1956	$2,441	2	$5,323,997

Year	Labor ('000)
1956	3,510
1957	3,540
1958	3,560
1959	3,580
1960	3,590
1961	3,610

(h) SWITZERLAND

Year	Import Value	Import Quantity	Balance of Trade #1	Balance of Trade #2
1956	$1,113	1	-$112,462	
1962	6,134	4	-4,344	
1963	8,336	6	- 659	-$1,500,000

Year	Labor ('000)
1956	2,370
1957	2,410
1958	2,440
1959	2,470
1961	2,590
1962	2,660
1963	2,710
1964	2,760
1965	2,800
1966	2,820
1967	2,850
1968	2,890
1969	2,920
1970	2,940
1971	2,970
1972	3,000
1973	3,030

APPENDIX III

FIRST DIFFERENCE PROGRAM*

```
$ RUN FORTG
        DIMENSION VARS (16,18) DIF (16,17)
        READ (3,100) VARS
100     FORMAT (4X, 2F7.4, 2F8.4, 2F9.4, 3F8.4, 4X/2F6.4,
                F8.4, 2F7.4, F6.4, F8.4)
        DO 300 J = 1,17
        DO 300 I = 1,16
300     DIF(I,J) = VARS (I,J+1) - VARS (I,J)
        WRITE (4,101) DIF
101     FORMAT (4X, 8F15.4/8F15.4)
        STOP
        END
```

CONSTANT ADDITION AND NATURAL LOG PROGRAM*

```
$ RUN FORTG
        DIMENSION VARS (12,17)
        READ (3,100) VARS
100     FORMAT (F7.3, F8.3, F7.3, 7F8.3, 2X/2F8.3)
        DO 200 I = 1,17
        DO 200 J = 1,12
200     VARS (J,I) = ALOG (VARS (J,I) + 12,000)
        WRITE (4,101) VARS
```

```
101     FORMAT (F7.3, F8.3, F7.3, 7F8.3, 2X/2F8.3)
        STOP
        END
```

*Program courteously written by Mr. Bruce Butler, Faculty of Business Administration and Commerce.

APPENDIX IV

TABLE IV-1

SCALE OF VARIABLE - FACTOR 1 - CORRELATIONS FOR CANADA

Unrotated Factor Loading		Percent of Variance	Rating
X_1	0.976	95	Excellent
X_2	0.957	92	Excellent
X_3	0.932	87	Good
X_4	0.900	81	Good
X_5	0.995	99	Excellent
X_6	0.996	99	Excellent
X_7	0.975	95	Excellent
X_8	0.995	99	Excellent
X_9	0.087	1	n.a.
X_{10}	0.925	86	Good
X_{11}	0.711	51	Fair
X_{12}	0.943	89	Good
X_{13}	0.986	97	Excellent
X_{14}	0.996	99	Excellent

TABLE IV-2

SCALE OF VARIABLE - FACTOR 2 - CORRELATIONS FOR CANADA

Unrotated Factor Loading		Percent of Variance	Rating
X_1	-0.122	1	n.a.
X_2	-0.090	1	n.a.
X_3	-0.149	2	n.a.
X_4	-0.061	0	n.a.
X_5	0.004	0	n.a.
X_6	-0.006	0	n.a.
X_7	-0.077	1	n.a.
X_8	0.002	0	n.a.
X_9	0.970	94	Excellent
X_{10}	-0.226	5	n.a.
X_{11}	0.300	9	n.a.
X_{12}	0.286	8	n.a.
X_{13}	0.145	2	n.a.
X_{14}	-0.029	0	n.a.

TABLE IV-3

PRINCIPLE COMPONENT 1: FIRST ORDER TIME COMPONENT MAJOR LOADINGS IN THE COMPONENT

Variable	Description	Loading
X_1	Export Value	0.976
X_2	Import Value	0.957
X_3	Balance of Payments #1	0.932
X_4	Balance of Payments #2	0.900
X_5	Gross Domestic Product	0.995
X_6	Gross National Product	0.996
X_7	National Income	0.975
X_8	Private Consumption	0.995
X_{10}	International Reserves	0.925
X_{11}	Bank Rate	0.711
X_{12}	Population	0.943
X_{13}	Labor	0.986
X_{14}	Capital	0.996

TABLE IV-4

PRINCIPLE COMPONENT 2: SECOND ORDER TIME COMPONENT MAJOR LOADINGS IN THE COMPONENT

Variable	Description	Loading
X_9	Exchange Rate	0.970

TABLE IV-5

SCALE OF VARIABLE - COMPONENT 1 - CORRELATIONS FOR U.S.

Unrotated Factor Loading		Percent of Variance	Rating
X_1	0.950	90	Excellent
X_2	0.957	92	Excellent
X_3	0.050	0	n.a.
X_4	-0.750	56	Fair
X_5	0.998	99	Excellent
X_6	0.998	99	Excellent
X_7	0.989	98	Excellent
X_8	0.997	99	Excellent
X_9	-0.138	2	n.a.
X_{10}	-0.821	67	Good
X_{11}	0.863	74	Good
X_{12}	0.952	91	Excellent
X_{13}	0.994	99	Excellent
X_{14}	0.979	96	Excellent

TABLE IV-6

SCALE OF VARIABLE - COMPONENT 2 - CORRELATION FOR U.S.

Unrotated Factor Loading		Percent of Variance	Rating
X_1	0.077	1	n.a.
X_2	0.173	3	n.a.
X_3	0.669	45	Fair
X_4	-0.516	27	n.a.
X_5	-0.009	0	n.a.
X_6	0.008	0	n.a.
X_7	0.043	0	n.a.
X_8	0.026	0	n.a.
X_9	0.881	78	Good
X_{10}	0.287	9	n.a.
X_{11}	-0.266	7	n.a.
X_{12}	-0.205	4	n.a.
X_{13}	-0.060	0	n.a.
X_{14}	0.076	0	n.a.

TABLE IV-7

COMPONENT 1: FIRST ORDER TIME COMPONENT
MAJOR LOADINGS IN THE COMPONENT

Variable	Description	Loading
X_1	Export Value	0.950
X_2	Import Value	0.957
X_4	Balance of Payments #2	-0.750
X_5	Gross Domestic Product	0.998
X_6	Gross National Product	0.998
X_7	National Income	0.989
X_8	Private Consumption	0.997
X_{10}	International Reserves	-0.821
X_{11}	Bank Rate	0.863
X_{12}	Population	0.952
X_{13}	Labor	0.994
X_{14}	Capital	0.979

TABLE IV-8

COMPONENT 2: SECOND ORDER TIME COMPONENT
MAJOR LOADINGS IN THE COMPONENT

Variable	Description	Loading
X_3	Balance of Payments #1	0.669
X_9	Exchange Rate	0.881

APPENDIX V

TABLE V-1

IMPORT FACTOR

SCALE OF VARIABLE - FACTOR 1 - CORRELATIONS FOR DATA

Varimax Factor Loading		Percent of Variance	Rating
X_1	0.033	0.00	n.a.
X_2	0.126	0.02	n.a.
X_3	-0.026	0.00	n.a.
X_4	0.969	0.94	Excellent
X_5	0.969	0.94	Excellent
X_6	0.927	0.86	Excellent
X_7	0.102	0.01	n.a.
X_8	-0.169	0.03	n.a.
X_9	0.080	0.01	n.a.
X_{10}	0.084	0.01	n.a.
X_{11}	0.170	0.03	n.a.
X_{12}	-0.262	0.07	n.a.
X_{13}	0.152	0.02	n.a.

TABLE V-2

IMPORT FACTOR

SCALE OF VARIABLE - FACTOR 2 - CORRELATIONS FOR DATA

Varimax Factor Loading		Percent of Variance	Rating
X_1	-0.056	0.00	n.a.
X_2	-0.094	0.01	n.a.
X_3	0.319	0.10	n.a.
X_4	0.145	0.02	n.a.
X_5	0.154	0.02	n.a.
X_6	0.164	0.03	n.a.
X_7	0.730	0.53	Good
X_8	-0.608	0.37	Fair
X_9	0.615	0.38	Fair
X_{10}	0.171	0.03	n.a.
X_{11}	-0.145	0.02	n.a.
X_{12}	0.103	0.01	n.a.
X_{13}	0.750	0.56	Good

TABLE V-3

IMPORT FACTOR

SCALE OF VARIABLE - FACTOR 3 - CORRELATIONS FOR DATA

Varimax Factor Loading		Percent of Variance	Rating
X_1	0.041	0.00	n.a.
X_2	-0.010	0.00	n.a.
X_3	-0.611	0.37	Fair
X_4	0.044	0.00	n.a.
X_5	0.045	0.00	n.a.
X_6	0.020	0.00	n.a.
X_7	0.359	0.13	n.a.
X_8	0.225	0.05	n.a.
X_9	-0.292	0.09	n.a.
X_{10}	0.774	0.60	Good
X_{11}	-0.191	0.04	n.a.
X_{12}	0.320	0.10	n.a.
X_{13}	0.133	0.02	n.a.

TABLE V-4

IMPORT FACTOR

SCALE OF VARIABLE - FACTOR 4 - CORRELATIONS FOR DATA

	Varimax Factor Loading	Percent of Variance	Rating
X_1	-0.805	0.65	Very Good
X_2	0.806	0.65	Very Good
X_3	0.110	0.01	n.a.
X_4	0.049	0.00	n.a.
X_5	0.040	0.00	n.a.
X_6	0.034	0.00	n.a.
X_7	-0.082	0.01	n.a.
X_8	0.134	0.02	n.a.
X_9	0.047	0.00	n.a.
X_{10}	0.042	0.00	n.a.
X_{11}	0.004	0.00	n.a.
X_{12}	-0.086	0.01	n.a.
X_{13}	0.066	0.00	n.a.

TABLE V-56

IMPORT FACTOR

SCALE OF VARIABLE - FACTOR 5 - CORRELATIONS FOR DATA

	Varimax Factor Loading	Percent of Variance	Rating
X_1	0.082	0.01	n.a.
X_2	0.033	0.00	n.a.
X_3	0.113	0.01	n.a.
X_4	-0.001	0.00	n.a.
X_5	-0.005	0.00	n.a.
X_6	-0.016	0.00	n.a.
X_7	0.075	0.01	n.a.
X_8	0.172	0.03	n.a.
X_9	-0.037	0.00	n.a.
X_{10}	0.094	0.01	n.a.
X_{11}	0.814	0.66	Very Good
X_{12}	0.647	0.42	Fair
X_{13}	0.024	0.00	n.a.

TABLE V-6

IMPORT FACTOR DESCRIPTION

Factor 1: INCOME

Major Loadings in the Factor

Variable	Description	Loading
X_4	Gross Domestic Product	0.969
X_5	Gross National Product	0.969
X_6	National Income	0.927

Factor 2: INGENIUM AD MERCATURA

Major Loadings in the Factor

Variable	Description	Loading
X_7	Private Consumption	0.730
X_8	Exchange Rate	-0.608
X_9	International Reserves	0.615
X_{13}	Capital	0.750

TABLE V-6 (Continued)

Factor 3: INTERNATIONAL TRADE POSITION

Major Loadings in the Factor

Variable	Description	Loading
X_3	Balance of Trade #2	-0.611
X_{10}	Bank Rate	0.774

Factor 4: DOMESTIC TRADE POSITION

Major Loadings in the Factor

Variable	Description	Loading
X_1	Import Value	-0.805
X_2	Balance of Trade #1	0.806

Factor 5: POPULATION

Major Loadings in the Factor

Variable	Description	Loading
X_{11}	Population	0.814
X_{12}	Labor	0.647

APPENDIX VI

TABLE VI-1

STEP-WISE REGRESSION RESULTS FOR EXPORT MODELS IN UNLAGGED DATA

---

1. UNITED KINGDOM

$R^2 = 0.22$

$(1-B)Y_t = (1.2794 + 2.0115\ F3_t - 1.5332\ F5_t)(1-B)$

In this model, variable F3 tends to dominate. With the inclusion of F5, the significance of F3 is raised although F5 has an insignificant beta coefficient.

2. BELGIUM - LUXEMBOURG

No reportable results

3. DENMARK

No reportable results

4. FRANCE

No reportable results

5: WEST GERMANY

No reportable results

6. ITALY

$R^2 = 0.18$

$(1-B)Y_t = (2.5646 - 0.0293\ F2_t)(1-B)$

TABLE VI-1 (Continued)

7. NETHERLANDS

No reportable results

8. SWEDEN

No reportable results

9. SWITZERLAND

No reportable results

10. UNITED STATES

No reportable results

11. CANADA

$R^2 = 0.33$

$$(1-B)Y_t = (-3.4371 + 2.5032\ F3_t)(1-B)$$

TABLE VI-2

STEP-WISE REGRESSION RESULTS FOR EXPORT MODELS IN ONE YEAR LAGGED DATA

---

1. UNITED KINGDOM

No reportable results

2. BELGIUM-LUXEMBOURG

No reportable results

3. DENMARK

No reportable results

4. FRANCE

$R^2 = 0.43$

$$(1-B)Y_{t+1} = (8.3587 - 1.0287F1_t - 0.5950F2_t - 0.7431F3_t)(1-B)$$

Variable F1 tends to dominate becoming more significant with the inclusion of variables F2 and F3 in each successive step.

5. WEST GERMANY

$R^2 = 0.22$

$$(1-B)Y_{t+1} = (3.0090 - 2.9702F3_t + 2.7618F5_t)(1-B)$$

No significant results

TABLE VI-2 (Continued)

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6. ITALY

No reportable results

7. NETHERLANDS

No reportable results

8. SWEDEN

$R^2 = 0.32$

$(1-B)Y_{t+1} = (3.1316 - 0.0696F1_t - 0.1238F2 - 0.0670F3_t)(1-B)$

Variable F2 dominates with acceptance of insignificant beta coefficient of F1.

9. SWITZERLAND

No reportable results

10. UNITED STATES

$R^2 = 0.38$

$(1-B)Y_{t+1} = (2.9896 - 2.5688F2_t + 2.4296F3_t)(1-B)$

11. CANADA

$R^2 = 0.28$

$(1-B)Y_{t+1} = (-3.1136 + 2.3737F3_t)(1-B)$

TABLE V-3

STEP-WISE REGRESSION RESULTS FOR EXPORT MODELS IN TWO YEAR LAGGED DATA

---

1. UNITED KINGDOM

No reportable results

2. BELGIUM-LUXEMBOURG

No reportable results

3. DENMARK

No reportable results

4. FRANCE

$R^2 = 0.23$

$(1-B)Y_{t+2} = (1.9523 + 0.2134F3_t)(1-B)$

5. WEST GERMANY

No reportable results

6. ITALY

$R^2 = 0.17$

$(1-B)Y_{t+2} = (2.4273 + 0.0261F2_t)(1-B)$

No significant results

TABLE VI-3 (Continued)

7. NETHERLANDS

No reportable results

8. SWEDEN

No reportable results

9. SWITZERLAND

No reportable results

10. UNITED STATES

No reportable results

11. CANADA

No reportable results

TABLE VI-4

STEP-WISE REGRESSION RESULTS FOR IMPORT MODELS IN UNLAGGED DATA

---

1. UNITED KINGDOM

No reportable results

2. BELGIUM-LUXEMBOURG

$R^2 = 0.66$

$$(1-B)Y_t = (2.6332 = 0.0737F4_t + 0.0139F5_t)(1-B)$$

Variable F4 tends to dominate and its significance is raised by the inclusion of F5; however, F5 is insignificant.

3. DENMARK

No reportable results

4. FRANCE

No reportable results

5. WEST GERMANY

No reportable results

6. ITALY

No reportable results

7. NETHERLANDS

No reportable results

TABLE VI-4 (Continued)

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8. SWEDEN

$R^2 = 0.09$

$(1-B)Y_t = (2.5210 - 0.0145F4_t)(1-B)$

No significant results

9. SWITZERLAND

$R^2 = 0.66$

$(1-B)Y_t = (2.4959 + 0.1123F1_t - 0.0391F3_t - 0.0776F4_t)(1-B)$

10. UNITED STATES

No reportable results

11. CANADA

$R^2 = 0.45$

$(1-B)Y_t = (8.7106 + 2.4878F1_t - 4.9554F4_t)(1-B)$

Variable F4 tends to dominate. F1 is insignificant yet raises the significance of F4 when included.

TABLE VI-5

STEP-WISE REGRESSION RESULTS FOR IMPORT MODELS IN ONE YEAR LAGGED DATA

---

1. UNITED KINGDOM

   No reportable results

2. BELGIUM-LUXEMBOURG

   No reportable results

3. DENMARK

   No reportable results

4. FRANCE

   No reportable results

5. WEST GERMANY

   No reportable results

6. ITALY

   No reportable results

7. NETHERLANDS

   No reportable results

8. SWEDEN

   No reportable results

TABLE VI-5 (Continued)

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9. SWITZERLAND

$R^2 = 0.26$

$(1-B)Y_{t+1} = (2.5389 - 0.0218F4_t)(1-B)$

10. UNITED STATES

$R^2 = 0.35$

$(1-BY_{t+1} = (29.4389 - 5.1052F1_t - 5.6385F2_t)(1-B)$

Evidence suggests that data may be contaminated.

11. CANADA

$R^2 = 0.40$

$(1-B)Y_{t+1} = (14.0592 + 5.5393F2_t - 8.6131F3_t - 1.5497F4_t)(1-B)$

Variable F3 dominates and F4 is insignificant.

TABLE VI-6

STEP-WISE REGRESSION RESULTS FOR IMPORT MODELS IN TWO YEAR LAGGED DATA

1. **UNITED KINGDOM**

$R^2 = 0.33$

$$(1-B)Y_{t+2} = (2.3141 + 0.0305F1_t + 0.0383F3_t)(1-B)$$

Evidence suggests contaminated data.

2. **BELGIUM-LUXEMBOURG**

$R^2 = 0.50$

$$(1-B)Y_{t+2} = (4.498 - 0.5056F1_t - 0.4385F2_t + 0.0905F3_t + 0.0420F4_t)(1-B)$$

3. **DENMARK**

No reportable results

4. **FRANCE**

No reportable results

5. **WEST GERMANY**

No reportable results

6. **ITALY**

No reportable results

TABLE VI-6 (Continued)

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7. NETHERLANDS

No reportable results

8. SWEDEN

$R^2 = 0.28$

$(1-B)Y_{t+2} = (2.6943 - 0.0359F1_t - 0.0485F2_t)(1-B)$

9. SWITZERLAND

No reportable results

10. UNITED STATES

$R^2 = 0.10$

$(1-B)Y_{t+2} = (-0.3736 + 1.2848F4_t)(1-B)$

No significant results

11. CANADA

$R^2 = 0.24$

$(1-B)Y_{t+2} = (-4.2535 + 2.7581F4_t)(1-B)$
